

# MODERN Machine Shop

HOWARD CAMPBELL, Editor

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Volume 9

OCTOBER, 1936

Number 5

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# MODERN Machine Shop

CINCINNATI, OHIO

VOL. 10, No. 5

OCTOBER, 1936

## Production Operations on York Refrigeration Units

*Half a century in the building of mechanical refrigerating equipment has developed some interesting manufacturing operations. Several of these operations are described in this article.*

BY J. H. VOGEL,  
Assistant Works Manager, York Ice Machinery Corporation

SINCE 1885 the York Ice Machinery Corporation, York, Pennsylvania, has specialized in but one thing—mechanical cooling equipment—and so it was but natural that such an organization should early become an inseparable part of the air conditioning industry. From the manufacture of refrigeration plants to the conditioning of air on a large scale was but a step; thus when the time was ripe for the introduction of air conditioning as an accessory to living, this firm was at once prepared to offer the advantages of equipment in which the refinements of a half a century's experience were embodied.

The variety of units regularly manufactured by the York Ice Machinery Corporation for refrigeration and air conditioning duty include all sizes from a small unit for a delicatessen shop to large units of the sizes used in theatres, department stores, res-

taurants, and public buildings. Illustrated in Figure 1 is a York four-cylinder enclosed single acting com-

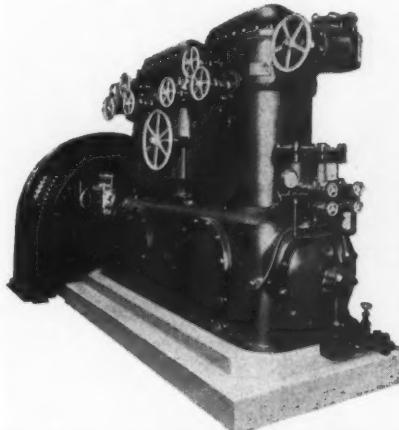


Fig. 1—York Four-Cylinder Single-Acting  
Refrigerating Unit

pressor in which all the best features of York design have been combined to produce what is considered the most efficient machine York has ever produced.

Illustrated in Fig. 2 is the equipment used to bore the cylinders for a triple cylinder compressor of a type slightly smaller than the machine shown in Fig. 1. The machine is a Footburtt vertical mill, equipped with two boring bars each of which carries three Carboloy cutter blades. All holes are roughed with these tools, then a double-end cutter is used in the same bars for semi-roughing, and a third set for finish boring. Approximately  $3/32$  in. of stock is removed on a side in the roughing operation,  $1/32$  in. in the second operation and approximately

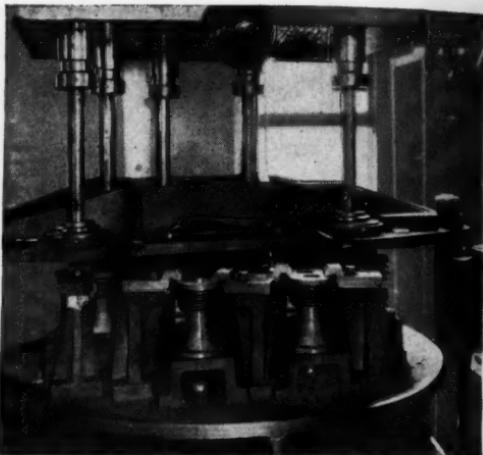


Fig. 3—Rough, semi-finish, and finish boring cylinders for a small type of air conditioning unit.

0.008 in. in the finishing operation, leaving  $1/64$  in. for honing.

Figure 3 shows the operation of boring cylinder blocks for the double cylinder units, this operation being performed on a Natco six-spindle boring machine. The turntable on the machine is laid out for the usual four stations, which includes one for loading. In the first operation the two holes are rough bored to leave approximately  $3/64$  in. of stock and at the second station the holes are again bored to leave  $1/32$  in. of stock. Final boring removes  $1/64$  in. which leaves sufficient material for a light diamond boring cut. The boring bars are fluted, which assists in chip removal, and are piloted at the bottom ends to insure accuracy. An average production of 15 blocks per hour is obtained on this operation.

In Fig. 4 is shown the Ex-Cell-O diamond boring machine with which the diamond boring operation on the cylinders referred to in the preceding paragraph is performed. The work-piece in the machine does not show very clearly, but one of the cylinders is shown standing on the ma-

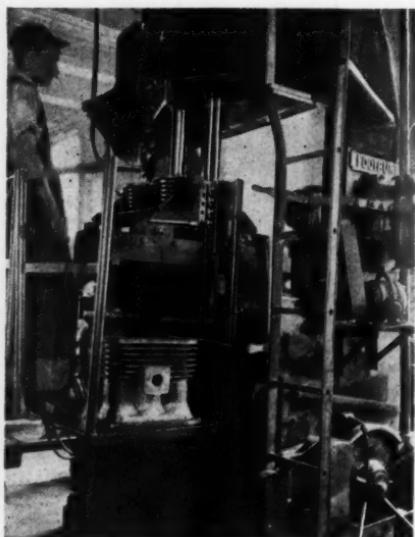


Fig. 2—Using a Footburtt Vertical Boring Machine to bore the cylinders for an air conditioning unit.

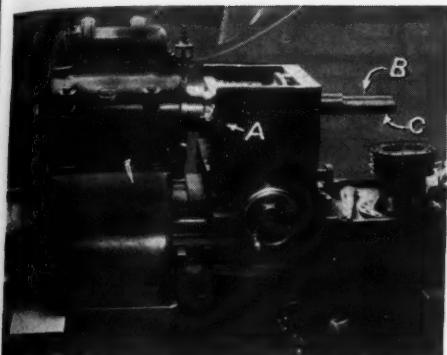


Fig. 4—The small cylinders are diamond-bored in this Ex-Cell-O diamond boring machine.

chine bed. The block is placed in the machine horizontally, and is held in position by the clamp indicated at A, which extends across the face of the fixture.

Before the block is finally clamped in position, two tapered plugs B and C are inserted into the bores from the rear, thus aligning the bores with the machine spindles and insuring that an equal amount of stock will be removed on all sides by the diamond tool.

The honing operation on a double cylinder block for a 4x4-in. machine is shown in process in Fig. 5. The machine was built in the York Plant especially for this job, and the hone is a Micromatic six-stone hone. Approximately 1/64 in. of stock is removed from the bores of these 4-in. cylinders, the limit on this operation being plus or minus 0.00025 inch.

The machine is hydraulically-operated, providing a work-range and flexibility which makes possible the most efficient speeds for honing all sizes up to the large 20-in. cylinders.

To provide the best possible bearing surface on the larger sizes of pistons, babbitt is applied to the outer surface of the piston with the apparatus shown in operation in Fig. 6. Here an operator is shown using a

"Metalayer" spray gun to spray molten babbitt onto the surface of a 12½x9-in. compressor piston. The babbitt is fed to the gun in the form of a wire, the gun being equipped with a feeding mechanism which is operated by air pressure from the shop airline. The air also supplies the force required for spraying the metal. In addition to being connected to the airline, the gun is also connected to oxygen and acetylene tanks by means of which an intensely hot flame can be obtained to melt the babbitt as it passes

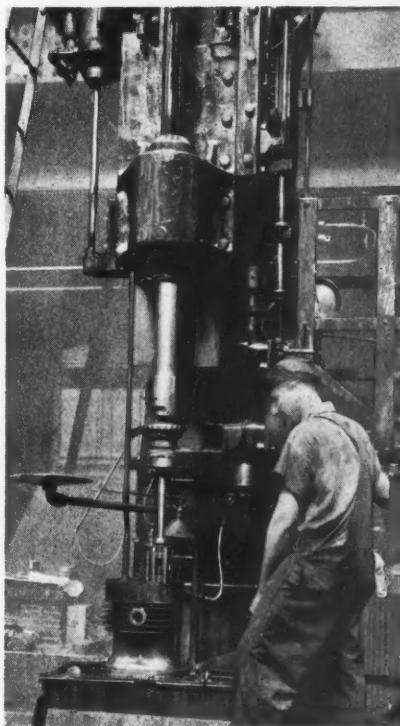


Fig. 5—With this hydraulic honing machine and a Micromatic hone the cylinder bores are honed to within plus or minus 0.00025 inches of drawing size.



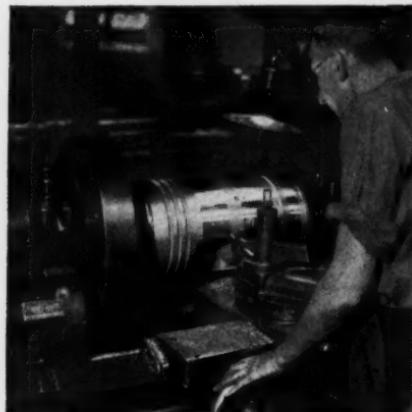
Fig. 6—Spraying molten babbitt onto a piston to form babbitt thrust surfaces.

through the gun. The babbitt is applied in three bands on the piston shown.

Figure 7 shows the operation

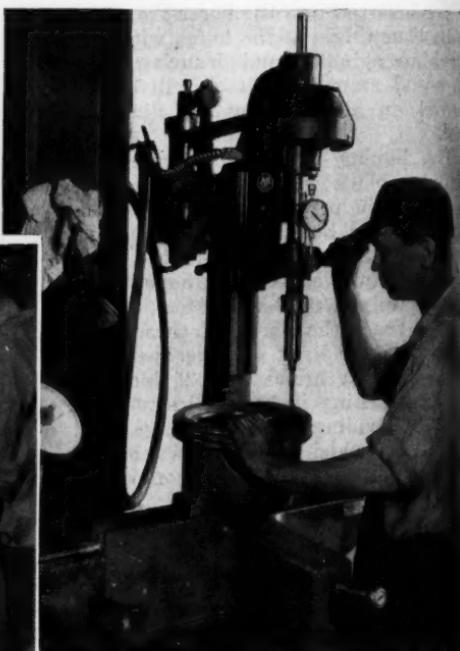
Fig. 7 (Below)—The babbitted sections of the piston are turned slightly larger than the cast iron portions, so as to provide a good bearing surface.

Fig. 8 (Right)—All running parts are balanced to eliminate vibration and aid in smooth performance.



of turning the outside of the large pistons referred to in the preceding paragraph. The machine is a LeBlond 19-in. heavy duty lathe, which is of a size to afford the rigidity required for such work. In turning the piston, the babbitted sections are turned slightly larger in diameter than the unbabbitted part so that the babbitt will contact the well of the cylinder instead of the cast iron.

All running parts in York compressors are balanced to eliminate vibration, insure quiet operation, and add to the life of the equipment. In Fig. 8 an operator is shown balancing a flywheel for a 1 1/4-in. air conditioning unit. The point and amount of unbalance is found by testing the wheel on the Taylor Balancing Machine upon which it is shown in the illustration, then the point of unbalance is lightened by drilling with a



October, 1936

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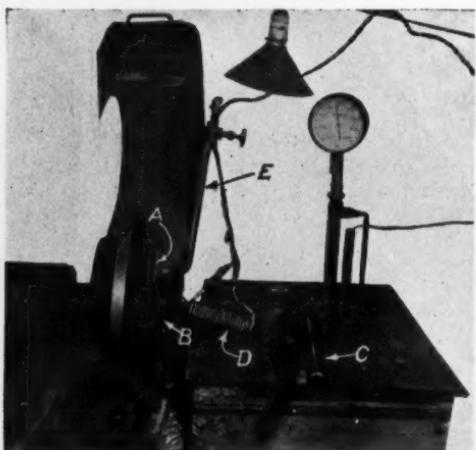


Fig. 9—Babbitt bearings are cast into the connecting rods by the centrifugal process, using this equipment.

light, high speed Canedy-Otto drilling machine as shown. Using a drill of a given size, the operator knows exactly how far to drill to remove the predetermined number of ounces. The dial indicator shown attached to the front of the machine registers the depth of the hole in thousandths of an inch.

Babbitt bearings are applied to the connecting rods by the centrifugal casting process, for which the equipment shown in Fig. 9 is used. The connecting rod, indicated at A, having previously been tinned, is clamped in position on a faceplate which is attached to the end of a horizontal motor-operated spindle which runs at a speed of 1800 r.p.m. The faceplate is solid, but the die B by which the rod is held has a hole through the center through which the

the molten babbitt is "shot" from the melting pot.

The melting pot, at the right in the illustration, is gas-fired and is equipped with a pyrometer to indicate the temperature of the metal. With the machine in operation, the lever C is raised and then pushed downward, operating a plunger which forces a measured charge of the molten metal through the tube D and into the bearing opening in the large end of the rod. The centrifugal motion of the rod "throws" the metal against the inner wall of the opening, forming a solid bearing.

Some difficulty was formerly experienced due to the tendency of the plunger to cool between "shots", but this difficulty has been eliminated by winding the tube with a heating element, as shown, which is connected to the lighting circuit. The current is kept on while the machine is in operation, thus keeping

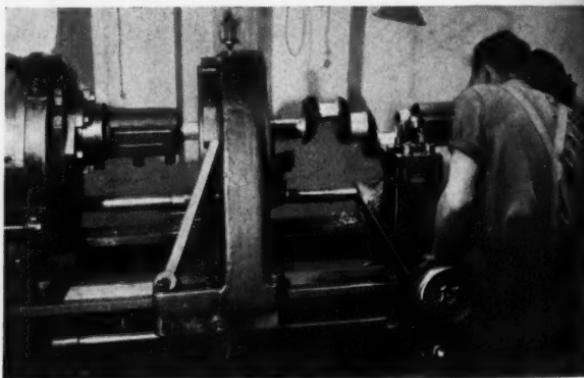


Fig. 10—Crankshafts are turned in a special crankshaft lathe.

the tube and plunger hot. The tube E is attached to the shop air-line and provides a blast of air to keep the die cool.

Crankshafts for York units are

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Fig. 11—One of the assembly lines on York Portable Air Conditioners.

turned in the special crankshaft lathe shown in operation in Fig. 10. The lathe has a faceplate at each end, with a "driver" by which the end of the shaft is gripped. The drivers and steadyrest bearing are coordinated so that the shaft can be shifted from one center to another in order to turn the main bearings and "pins" on the several throws. These special fixtures reduce non-productive time to the minimum and insure accuracy in the alignment of the journals.

Figure 11 is a view of one of the assembly lines on York portable air conditioners. These units, the first on the market to eliminate water connections by cooling the refrigeration unit with air, are meeting with great favor for the cooling of single rooms. One of the new features is a "pump out" device for freshening the air in the room, with optional heating and humidifying for winter use.

Air conditioning has achieved recognition not only as a convenience

and an accessory to comfortable living, but also as an important factor in certain types of industries. An increasing number of modern manufacturing plants similar to the York Ice Machinery Corporation's plant, described in this article, are air conditioning their inspection departments so that the work may be tested under ideal conditions of temperature and humidity. The quality of workmanship on mechanical units of all kinds is being increased, which is equivalent to saying that limits and tolerances are being narrowed. Limits of perhaps one or two ten-thousandths of an inch are becoming quite common, but such workmanship calls for ideal working and inspection conditions.

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# Co-Operative Apprentice Training in Springfield, Vermont

*The author tells how the manufacturers in one industrial community have combined to solve their skilled-labor problem.*

BY RUSSELL STILES

**C**O-OPERATIVE education can be defined as an attempt to combine theory and practice in a single course by so interweaving shop work with school work that the student is devoting one-half of his time to practical applications of the theories under actual trade conditions. The other half is spent in the class-room studying the necessary trade science such as mathematics, mechanical drawing, physics, chemistry, and so on. The curriculum should also include subjects which will tend to make a good citizen out of the student; civics, history, English, and economics.

The town of Springfield, Vermont, is well adapted for such training. With a population of approximately 7,000, it has five well-equipped machine shops, a foundry, and a wool-reclamation plant. The manufacturers of the town have steadily and enthusiastically given their support to vocation training for more than twenty-three years.

In 1913, as a result of the efforts of James Hartness, W. D. Woolson, E. R. Fellows, Everard Stubbs, and H. D. Casey, Superintendent of Schools, the course was organized as a department of the Springfield High School. As Organizing Director,

Springfield was fortunate in securing John Bruggeman, who had been a member of the first class to graduate from the University of Cincinnati's co-operative course. The University of Cincinnati, under the direction of Dean Schneider, was the first college in the country to inaugurate the co-operative system of education.

The co-operative system of Springfield has been under the direction of John M. Pierce since 1918, the original plan having been carried on, with minor changes, for 19 years. The firms whose plants were included in the original co-operative plan were the Jones & Lamson Machine Company, the Fellows Gear Shaper Company, Bryant Chucking Grinder Company, and the John T. Slack Corporation.

In 1931, due to circumstances set up by the depression, the manufacturers of Springfield felt that it would be unfair to workmen with families to continue the original plan, so the students were assembled into groups in each shop under the direction of a shop foreman and the instruction was continued, but without pay. During this period the students did not work on the usual machine parts, but were allowed to manufacture and sell home workshop equipment.



Each student takes his turn as foreman, clerk, inspector, draftsman, and so on until he is familiar with the duties of each position.

ment such as bandsaws, drill presses, bench lathes, and other light, small-sized machines.

In the fall of 1933, a consolidation of activities seemed advisable and all of the students in the course—about 50 in number—were grouped into one department which was set aside for the purpose by the Fellows Gear Shaper Company. The department has about 6,000 square feet of floor space and is well equipped with machines furnished jointly by the Fellows Gear Shaper Company and the Jones & Lamson Machine Company. An outfit of tools and cutters is supplied by the Lovejoy Tool Company. The department is so situated that it is adjoined by the regular plant departments on three sides.

The students are divided into two groups and alternate according to the original plan; that is, they spend two

weeks in the shop and then two weeks in school. All instruction is under the direction of an instructor who is supplied from the local high school.

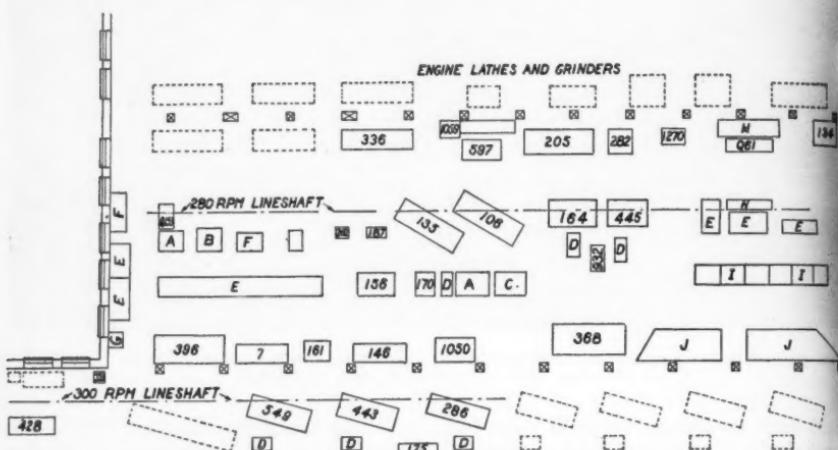
The equipment is indicated on the floor plan shown herewith. It includes four bar turret lathes, two chucking turret lathes, five engine lathes, five grinders of various types, four milling machines, two drill presses, a gear shaper, a planer, and a shaper. Provision is made for instruction in drafting, and equipment is supplied for filing blueprints and drawings. The usual accessories, such as benches and vises, are also included as a part of the equipment. As it is required, other equipment is available in the regular departments of the factory; thus the students have the advantages of additional lathes, milling machines, large surface grinders, horizontal boring mills, and so

on. They also have access to the blacksmith shop, sheet metal shop, and heat treat equipment.

Some of the machines that were contributed required a certain amount of repairing to put them into first-class condition, and guards were lacking on many of them. With the thought in mind that the average boy, even though interested in shop work, is more prone to carelessness than

latitude, as all the functions of a machine-building plant are carried on, each student taking his turn at the various tasks and machines. Every two weeks, as the classes alternate, the instructor assigns the students to certain specific tasks as follows:

**FOREMAN:** General supervision over the department. He assigns the jobs to his fellow students and indicates what machines are available for



Layout of Co-operative Apprentice Training Department in plant of Fellows Gear Shaper Company, Springfield, Vermont.

an older person, a special effort was made to provide guards for all danger points. As fast as the repair work was completed, the installation of adequate guards was taken up.

The boys made the necessary drawings of the guards that were required, and then proceeded to make the sheet metal covers and the brackets with which the covers were to be held in place. Both the shop management and the students feel that considerable progress has been made toward the prevention of accidents, and the importance of guards over running parts has been impressed upon the students.

The present instruction set-up might be described as a factory in min-

the work.

**FOREMAN'S CLERK:** Issues orders for steel, production materials, department supplies, and so on, and writes up job tickets. Has charge of department tool crib.

**STOCK CHASER:** Issues orders for new castings or other rough stock, and has charge of parts in process. Checks incoming castings or forgings and supervises progress of parts through the shop.

**TOOL SETTER:** Helps set up jobs on machine and grinds tools. Sets speeds and feeds. Reports damaged or broken tools.

**INSPECTOR:** Checks work after each operation to see if pieces are fin-

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ished to limits as given on blueprint. Stamp part numbers on completed pieces. Checks new patterns. (Responsible only to shop instructor.)

**DRAFTSMAN:** Makes new drawings and changes on drawings. Designs jigs and fixtures. Makes up stock lists and assigns part numbers to new work. (Responsible only to shop instructor.)

**MACHINE OPERATORS:** Assigned to operation of the various machines, working on jobs assigned by the foreman. Blueprints furnished by foreman's clerk.

**ASSEMBLY FLOOR MEN:** Assemble parts to make the finished machines. Paint. Test. Ship.

**REPAIR MEN:** Repair machines and equipment that may be broken or out of order. General maintenance.

**CLEAN-UP MAN:** Collects and dumps chips and trash. Sweeps.

Cleans machines. Keeps raw stock in order.

**PATTERNMAKER:** Makes new patterns and core-boxes, also changes and repairs on old patterns. The patternmaker works in the company pattern room under the supervision of the pattern foreman. Patterns are painted Standard Foundrymen's Code colors, except that the coreprints for patterns made by the apprentices are painted green, which makes it possible to identify them later if necessary.

Assembly drawings and details are made in pencil, on transparent bond paper, and prints are made in the company blueprint room. Each type of machine has its part list, typed on similar paper. A simple drafting room system is used, number grouped by even hundreds indicating the type of machine or model, such as SHS-100.

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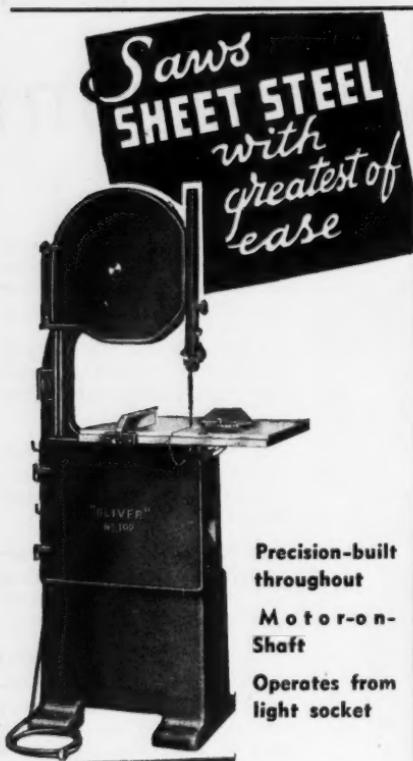
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This "Oliver" 18-inch Band Saw has all the refined mechanical features developed for larger "Oliver" Band Saws. Metal Workers find it especially effective in sawing sheet steel. Also other sheet metals, sprues of soft metal, plywood compositions, wood, etc. Rips to 11" wide. Table tilts 45° to right. A sturdy, precision-built saw in every detail.

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te SHS-199 for the bench band saw parts, SHS-200 to SHS-299 for circularsaw parts, and so on.

A toolrib containing a stock of drills, taps, reamers, collets, and similar small tools in an important part of the department. Many of the tools have been salvaged from among those discarded in the regular manufacturing departments of the plant.

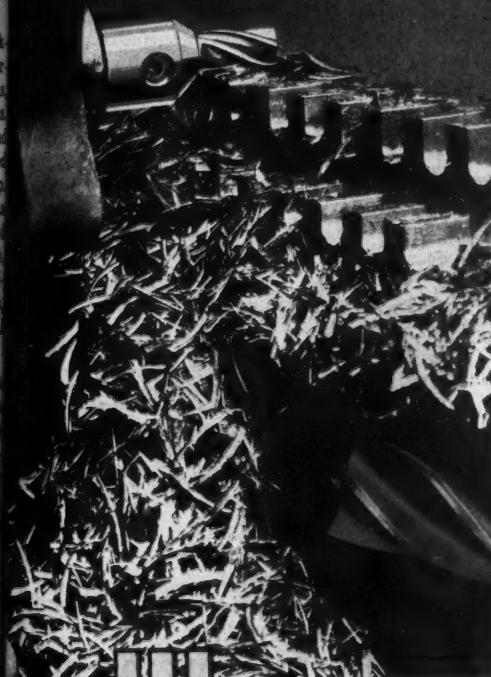
The bench machines previously referred to comprise the important part of the work assigned to the students the line having been added to so that a complete line of these machines for the home workshop is now being made. The machines are sold in the local market, without advertising.

Other lesson tasks include the making of machinist's tools such as surface gages, tap wrenches, vee blocks, toolmaker's clamps and similar tools. These tools are hardened and ground where necessary and when finished are usually given to the boys to keep. Thus when the boy graduates he has the foundation for a complete set of tools. The department also makes for its own use, several styles and sizes of machine vises, taper collets, parallels, jigs, fixtures, and special gages.

Work in process and inspection is gaged by standard plugs and gage that are drawn from the company toolrib in the usual manner. Whenever possible steel scrap is used, and the instructor has access to the steel scrap storage in all the shops of the town. Many good pieces of steel are salvaged, such as short ends of bar work that has been turned undersize or drilled oversize, and so on. While it would not pay the manufacturing plant to salvage this scrap, it can be reworked in the training department and serves as well as new steel. Carburizing and cyaniding are handled by the company's heat treating department.

In addition to the regular work in

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the department, students have ideas of their own, from time to time, which they desire to develop. To provide for this important phase of the work, one day a week is set aside for each student to make whatever he likes, and this day, incidentally, brings to light the various hobbies and outside interests of the students. The making of hunting knives, skate sharpeners, repair work on bicycles, guns, and pistols are a few of the tasks upon which they spend their time.

Others construct saw rigs for cutting wood to stove-length, governors for gasoline engines, wedges and sledge hammers for splitting wood, and so on. A number of double-runner bob-sleds, the iron shoes for which were forged by the students, have been constructed.

The form in which the training course has been operated through the past few years has not been ideal, due

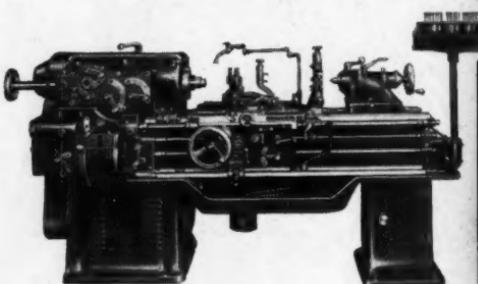
to the fact that the students have not been paid a regular rate for their work and also to the fact that, while production was slow, the number of pieces in a lot was limited and the student didn't obtain adequate training in present-day speeds and feeds. However, the senior class—18 in number—was admitted to the shops to work for pay at the beginning of the last term, and gradually the former methods of instruction will be inaugurated.

The original idea of the course was to discover and develop material for foremen, demonstrators, salesmen, draftsmen, toolmakers, and similar responsible positions. The results desired have been achieved far beyond the hopes of the originators of the plan. Many of the graduates of the course have gone on to take engineering courses in various colleges and universities, and several have graduated from those courses with high

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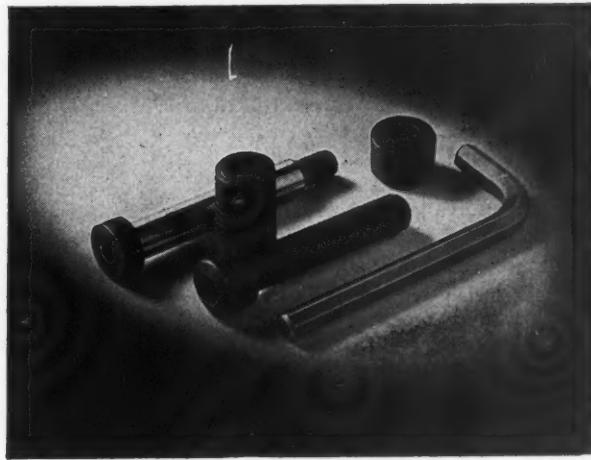


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honors. Responsible positions in the production, engineering, and sales divisions of Springfield's industries are held by graduates of the course.

A survey of graduates of the course, made in January, 1936, by Director John M. Pierce shows the following:

Total graduated (20 classes) 1916 to 1936	290
Dead	8
No record	5
Now in college	7
Balance; available workers	270
Employed in local shops	164 or 61%
Employed in non-local shops	53
Otherwise employed where the training received is essential to the work being done	13
Total using training received	230 or 85%

The remaining 15 per cent who are not using their co-operative training in their work include a priest, a contractor, several salesmen, several teachers, a lawyer, a radio announcer, an architect, a merchant, an express agent, and so on. In spite of the recent depression, only two were known to be unemployed. The five not traced should carry the same averages as the 270 studied.

(Federal aid for vocational instruction is available to approved schools as provided for under the Smith-Hughes act of 1917, and is disbursed by the State Director of Vocational Education in each state. One-half the salaries of the director, shop instructor, and other teachers of the high school faculty who have classes of co-operative students is paid from Federal funds.)

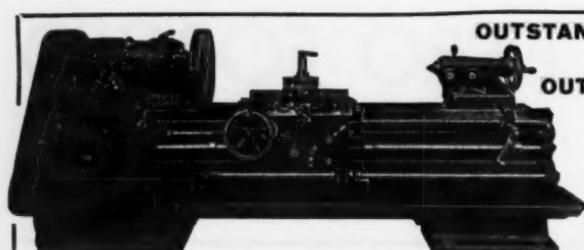
## Maintenance and Lubrication of Rolling Mill Bearings

The Timken Roller Bearing Company, Canton, Ohio, has issued a 20-page 8½ x 11 in. booklet on the subject of "Maintenance and Lubrication of Bearings in Rolling Mill Equipment". This new publication discusses in detail the recommended practice for assembling Timken Bearings of various types, their repair, adjustment and lubrication. Photographs illustrate the several types of bearings discussed and diagrams clearly show the system of assembling marking for the four types in common use in rolling mills.

Recommended practice is outlined and a convenient chart shown for keeping track of bearing use and life. This summary is particularly valuable in connection with roll-neck bearings.

Drawings illustrate suitable equipment for washing and reassembling heavy mill bearings, both straight and tapered bore mountings being illustrated.

Included in this new Timken maintenance booklet is a full discussion of the subject of lubrication, outlining the various types of problems which may be encountered and how these should be handled. Lubricants and the methods of lubricating now in use are discussed fully and specifications are given for both oils and greases for use with Timken Bearings. Four tables present in compact form the type and viscosity of lubricants recommended for Timken Bearings in general machinery and heavy-duty applications for various temperature conditions, sizes of bearings and moisture conditions. Copies free upon request.



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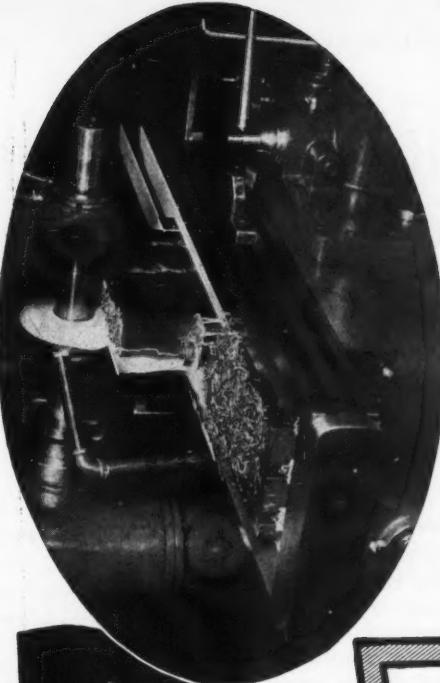
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# Methods Engineering Installation: Introduction and Administration

*The final article of the series, in which the author presents some practical ideas for the benefit of any who may be considering installing a Methods Engineering Department.*

BY H. B. MAYNARD,  
President, Methods Engineering Council, Inc., Pittsburgh, Pennsylvania

THE plant which contemplates making a methods engineering installation should recognize at the outset that if satisfactory results are to be obtained the installation must be properly made. Methods engineering is a specialized branch of engineering and requires background, study, and experience for its mastery just as does any other branch. To attempt to introduce motion study, time study, or wage incentives with only a bare understanding of what they comprise is not only unwise and likely to lead to disappointing results, but it is also dangerous.

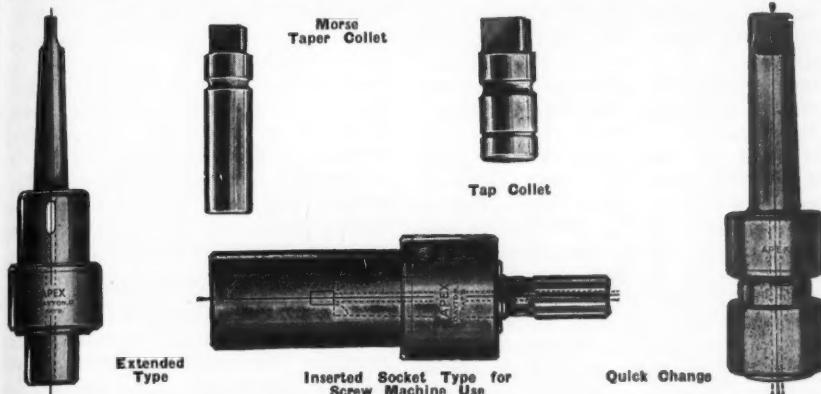
Methods engineering deals with certain items of vital importance; earnings, trade knowledge and skill, working effort, and so on, and if the installation is to be made with harmony between management and labor, it must be made with a full understanding of the problems of each and how they can be solved to the benefit of all concerned.

It would be quite possible for an intelligent individual to examine an engine lathe closely and then go to his work shop and design and build one which resembles the original and

which might even run. If, however, this man has no knowledge of the principles of machine design, strength of materials, and so on, it is unlikely that his lathe will prove satisfactory in actual service. When it is subjected to the strains of every day use, it will break down at points where insufficient allowance was made for the stresses involved, and it will produce inaccurate work.

The same condition exists in the field of methods engineering. It is possible to view an installation which is operating satisfactorily in another plant and to attempt to go and do likewise, but unless the one who is charged with the responsibility for making the installation is fully cognizant of the steps which must be taken, it is unlikely that the installation will be a success. It will break down when unforeseen conditions arise, and although it may be patched up by temporary expedients and started off again, it may never operate satisfactorily. Finally, in despair, the whole plan may be abandoned with the feeling that methods engineering will not work under the particular conditions involved.

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Sockets are furnished for Morse Taper or straight shank tools. Shanks are furnished in any taper or straight diameters to fit any size or style of machine spindle, or with adapter shanks to General Motors or Chrysler Motor standards.

Apex Floating Holders are also furnished with quick change chucks so that collets for Morse Taper or straight shank tools and collets for taps may be quickly changed.

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### Universal Application of Methods Engineering

That methods engineering will give good results under any conditions has been demonstrated again and again by those industries which have gone about the installation properly. Although the many examples of successful installations on all kinds and classes of work should demonstrate convincingly the universal application of the methods engineering procedure, there is a tendency on the part of those not thoroughly familiar with it to feel that their own work is somehow different and hence that a methods engineering installation will not produce results for them. Time and again the methods engineer hears such statements as: "That is undoubtedly fine for the work of the Blank Company, but our work is different. Therefore, methods study is impracticable."

The fact which illustrates the utter lack of basis for this feeling is that it makes no difference what "our work" is. If it happens to be of a jobbing or small quantity nature, it is felt that the field of methods study is limited to mass production. If a plant is engaged in turning out a single product, it is felt that methods study is more useful where the work is more varied. A foundry owner feels that the technique is more applicable to a machine shop, while the machine shop executive feels that it is useful chiefly on assembly work. Indeed, so universal is this feeling that the technique applies to all kinds of work but the kind which is under consideration that the methods engineer expects a prompt expression of it as soon as the subject of methods engineering is raised, and, incidentally, is seldom disappointed.

Those who have been following this series of articles will realize that the principles of methods engineering are fundamental. The methods engineer

deals with such basic factors as the 18 basic divisions of accomplishment, the 5 laws of motion economy and their 8 corollaries, the 5 classes of motions the human body can make, and leveling factors which adjust for skill and effort. It makes no difference if a plant is manufacturing toys, tools, trains, or tractors; the principles apply equally to all. The details with which the studies are conducted varies with individual conditions as explained in the preceding article: "Methods Engineering Installation: Mapping Out the Program," but there is a practical procedure for any set of conditions which may be encountered in industry.

### Preparatory Steps

In preparing for a methods engineering installation, the management must be fully convinced of the truth of the foregoing. The installation can not be made overnight, and the management must be willing to stand behind the installation and impart confidence and encouragement to the entire organization during the introductory stages.

When the management decides that it wants the installation, it is faced with the task of selecting someone to do the job. Above all else, an experienced individual must be chosen to head up the work. He may be a consultant engaged to introduce the plan and set it up, leaving the running of the plan to others, or he may be an experienced methods engineer who is hired as part of the regular organization. As long as he knows his job, it makes little difference which plan is followed.

The next step is to outline the broad general policies which are to be followed. Usually the methods engineer outlines a plan which, after discussion and perhaps revision, is finally adopted by the management. At this time, the type of studies which may profitably be made is de-

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cided upon. A wage incentive plan is chosen if none is in use at the time, and certain administrative policies are set up. Matters such as the guaranteeing of time allowances indefinitely or for a limited time, payment for defective work, lateness and so on, method of paying incentive

installation proper can proceed.

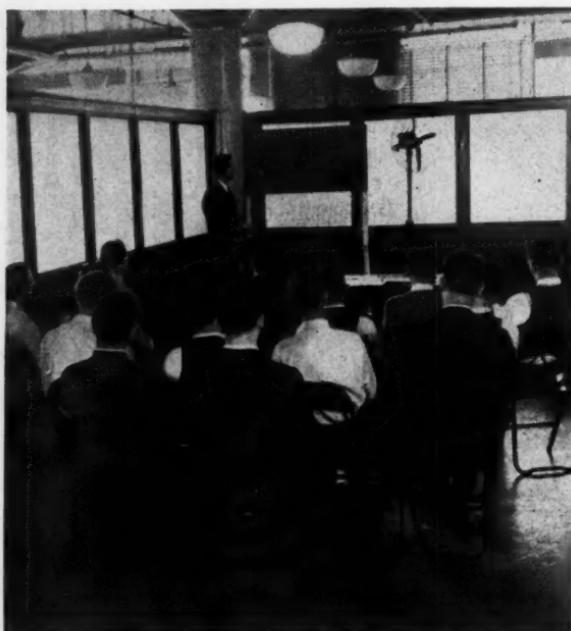
#### Beginning the Installation

Before any detailed studies are begun, if the plant is unused to this type of work, the organization should receive a thorough explanation of the objectives that are being sought.

This is extremely important, and, unfortunately, all too often improperly handled.

Workers naturally are suspicious of anything new introduced by management. They are inclined to feel that their interests will suffer if any changes are made, and they wish to cling to present and familiar conditions, even if they are not particularly desirable. Unless changes are properly presented, they are almost certain to be resisted at first, regardless of what they are.

A certain plant engaged on a processing operation was having difficulty in controlling the quality of its product because of variations in temperature



The supervisory group must receive a thorough understanding of the aims and principles of methods engineering.

workers for non-incentive work, wage scales, job classification, and the like are settled.

If the plant has done little along modern lines, it may be necessary to pause at this point to standardize conditions and practices before going further. The classification of work and the setting up of fixed wage scales for various jobs is necessary to the smooth working of any shop. The experienced methods engineer will know what preparatory work must be done before the work of the

and humidity. To remedy this matter they built a new building and air conditioned it throughout. Temperature and humidity were closely controlled, and since as long as they were fixed it did not matter what they were, they were made ideal for human comfort. When the building was completed, the operators were moved from the old plant to the new. They worked there one day and then struck. Their grievance was that they weren't allowed to open the windows.

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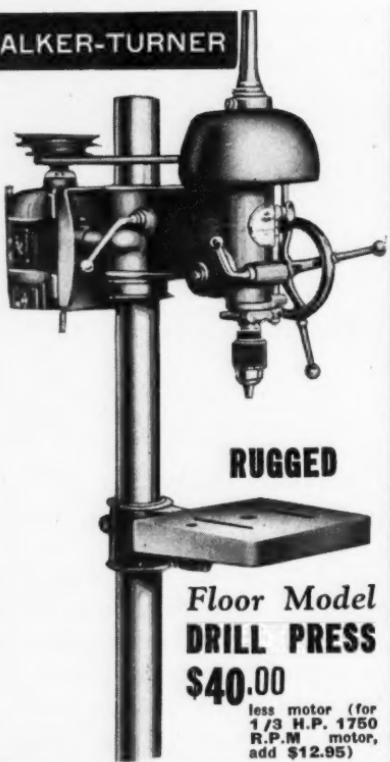
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*Engineered* POWER TOOLS

This incident illustrates clearly the need of preparing the way for changes. The new building was more comfortable and healthful than the old, but the operators only knew that they weren't allowed to open windows in summer when they were used to having windows open, so they objected. Methods engineering presents many greater complexities which must be clearly presented if co-operation is to be obtained.

It is usually impractical to explain the details of a methods engineering installation to each operator, and therefore the approach is made through the foreman. The usual practice, when any formal explanation is made at all, is to call the foremen together in a meeting at which the methods engineer, after an introduction by the management, explains which is proposed and offers to answer any questions.

Unfortunately a single meeting is usually insufficient for imparting a thorough understanding of methods engineering to those who are unfamiliar with it, and who, because of their unfamiliarity, are perhaps prejudiced against it. The subject of methods engineering is large, and although with careful preparation a trained methods engineer can outline the procedure in about two hours, the supervisors are unlikely to absorb much of what he says. Sentences which are crystal clear to the methods engineer are not so clear to those who are hearing of the subject for the first time, and the supervisors are likely to leave the meeting with a bewildering array of unfamiliar terms such as allowances, laws of motion, fatigue, leveling, incentive efficiency, and so on ringing in their ears.

If a man does not understand a subject himself, he is unable, of course, to explain it to anyone else. Therefore, it is essential that the foremen really understand methods

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Cut illustrates our Heavy Duty Machine for 3" materials.

engineering before they are called upon to explain it to those under them. Since one meeting is obviously insufficient for explanatory purposes, more should be held, and the meetings should continue until it is certain that all who attend have an understanding of the subject.

This may seem like a theoretical procedure which is likely to delay the installation beyond practical limits of time. This is not the case, however. Experience has shown that two or three months devoted to the proper introduction of methods engineering yield big returns. When the supervisors of an organization thoroughly understand methods engineering, begin to desire it, and are able to talk a common language about the various procedures it involves, progress from that time on is rapid.

Many modern plants, therefore, have been conducting training courses in methods engineering for their key supervisors as a means of preparing for the introduction of extension of methods studies. The purpose of these courses is not to make time study engineers out of the foremen, but rather to instill in them a knowledge of and a desire for efficient working practices, to the end that they will be able to cooperate intelligently with the methods engineer in making improvements. Articles telling of the success of such training programs have appeared from time to time in the various management magazines.

#### Labor's Attitude

When the worker does understand what methods engineering is, does he find anything in it which is objectionable to him? The writer has had considerable experience in conducting methods engineering discussion groups which have been attended not only by supervisors, but also by incentive workers, group leaders, industrial committee men, and union

representatives. In every case, when the procedure has been thoroughly set forth these men have expressed themselves as being convinced not only of its fairness but also of its beneficial results to the workers themselves.

They see that the procedure is not designed to get more work out of them by speeding them up beyond human endurance, but rather that it first sets up an easier and less fatiguing method, then measures accurately the time required to follow that method taking into account all conditions which are encountered, finally pays extra rewards for steady, skillful performance. They learn that effort is not nearly as important as method in securing output, and that undue speed usually reduces overall output because it results in excessive fatigue.

When the worker learns that the methods engineer is not interested in speed, but rather in evolving easier methods, his whole attitude changes. In one case, a union man who had attended a series of meetings on methods engineering for the purpose of protecting the interests of labor requested when the course ended that he be considered for a position in the methods engineering department. He felt that he could do more for his fellow workers by extending this fair procedure which considered the workers' problems as well as those of management than by his union activities.

Methods engineering, therefore, is definitely acceptable to labor when—but only when—it is clearly understood. As long as workers regard it as a device to reduce earnings, get more out of them for less money, or for reducing them to the status of a cog in a vast machine, they will resent it openly or secretly. If they understand its aims, however, they find a new interest in cooperating

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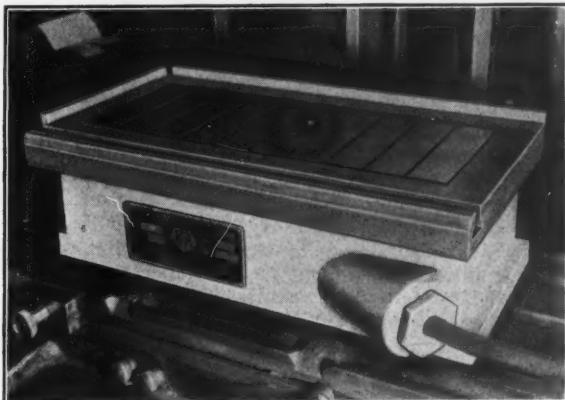
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# A CHUCK THAT DEMAGNETIZES Completely!

## THE **KAR** DUO- MAGNETIC CHUCK



... completely demagnetizes any piece of Hardened Steel—an exclusive and patented feature. Saves the cost of a separate demagnetizer—speeds production by eliminating the entire operation of moving the work to a new location for demagnetization.

Advanced magnetic design gives the KAR DUO-MAGNETIC CHUCK a minimum holding power of 125 lbs. per square inch, depending on the size of the chuck, with no increase in current

requirements. Its special water-tight construction permits wet-grinding, etc., with no danger of an electrical breakdown. These chucks can be supplied for both A.C. or D.C. of any commercial voltage or frequency. Each unit operates independently of the others without the need of an expensive Motor Generator—increasing efficiency and eliminating danger of Motor Generator failure which would throw all chucks out of service.

Finest materials, accurate construction and thorough testing before and after assembly insure long satisfactory service in every KAR DUO-MAGNETIC CHUCK.

*Write for Bulletin giving complete facts.*



**THE KAR ENGINEERING COMPANY, Inc.**

200 HUDSON STREET

NEW YORK, N. Y.

with the methods engineer, and in working out better ways of doing their work.

#### The Installation

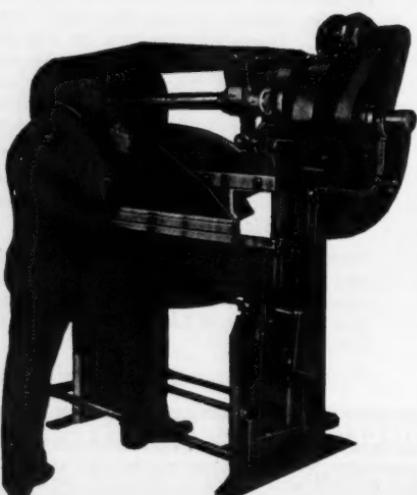
If the preparatory steps have been properly taken and if the organization understands what is wanted and hence is in sympathy with the installation, the subsequent steps can be made easily and quickly. The actual time required to study and improve a job is small compared with the time required to induce uncooperative workers and supervisors to make the necessary changes. The ever present human tendency to be satisfied with things as they are must be reckoned with as well as the power of habit and routine.

Workers, even when they honestly desire to cooperate, will often object to a methods change on the grounds that the new method requires more time than the old. In all probability they are right in this at the start,

for it requires time to break old habits and form new ones. The fact that the new method can eventually be performed in less time can be clearly demonstrated to the worker by the following simple experiment.

The methods engineer who encounters operator resistance to a new method may ask the operator whether it is quicker to write a word of 12 letters or one of 6 letters. The operator invariably replies that it is quicker to write a word of 6 letters, which, of course, is correct. The methods engineer then suggests checking this with a stop watch. First he requests the operator to write the 12-letter word San Francisco. This is found to require about .0015 hour to write. He next asks him to write the word Philadelphia, leaving out every other letter, which will give a 6-letter word. The operator tries and of course takes three or four times as long to write the

## THIS No. 253 CHICAGO STEEL PRESS



**Will Do 40% to 60% of the Forming Work Turned Out by the Average Shop**

This compact, ruggedly built, 48", No. 14 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

**Write for Circular No. 253**

**DREIS & KRUMP MFG. COMPANY**

**7418 LOOMIS BLVD.  
CHICAGO ILLINOIS**

er, 1936

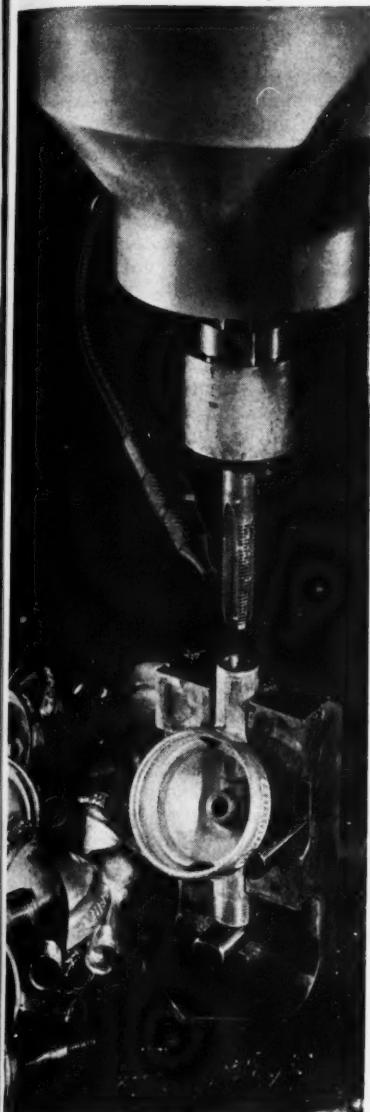
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Here's  
**REAL Tapping  
Production**

**1450 PIECES PER HOUR!  
DOUBLE THE OLD OUTPUT!**

New speed. New precision. New production volume. Notice the quick-acting fixture. No clamps or hold-downs here. Notice the very thin wall of the casting. Yet the rigid Haskins spindle maintains a class 3 fit without difficulty.

The exclusive features of the Haskins Method are illustrated and explained in our new booklet, "High Speed Precision Tapping." Write for your copy. It's free. It will pay you to read it. R. G. Haskins Company, 4667 West Fulton St., Chicago.

One of a series of case histories showing tough jobs made easy by The Haskins Tapping Method.

Material.....Zinc Base Die Casting  
Size of Thread..... $\frac{3}{8}$ "—24  
Length of Thread..... $\frac{3}{8}$ "  
R.P.M. Threading "in".....1080  
R.P.M. Threading "out".....2160  
Production....1450 Pieces per Hour



**THE HASKINS METHOD**

European Representative—G. E. Marbaix, Ltd., Vincent House, London, S. W. 1.

word. He justifies this on the grounds that Piaeipi is not a word. The methods engineer points out that it is not a word he knows how to write, although it might be a word in some other language.

Whether it is a word or not, however, with a few minutes practice anyone can write it in about .0008 hour. At first when one does not know how to write the word, it takes time to figure it out. When one learns the word, the time is less than for writing San Francisco, the 12-letter word. The same condition is true when any new job is begun. It takes time to learn how to do it, and an easy method unlearned may at first require longer than a more difficult method which is known.

This simple demonstration is remarkably effective in overcoming operator resistance to new methods.

#### Administration

The administration of a methods engineering installation does not present any particular difficulties to the trained methods engineer. If a consultant is retained to make the installation, care should be taken to make sure that he trains a member of the regular organization to carry on after he leaves. If the supervisory force is trained in the principles of methods engineering by a series of educational meetings, this point is automatically covered.

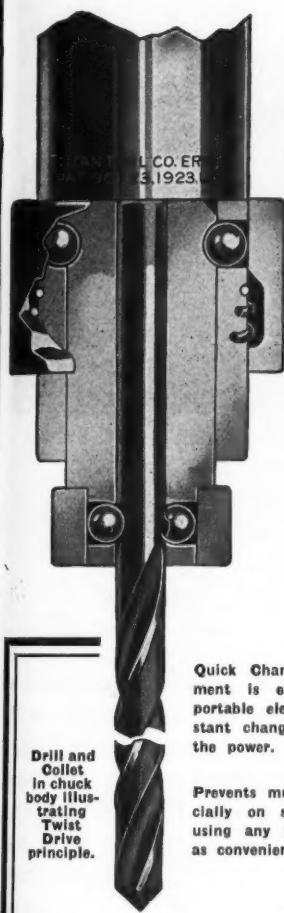
The policies, rules, and regulations which surround any methods engineering installation should be set up with fairness to men and management. No worker likes to be penalized for conditions which he can not control. Management does not wish to pay for careless or ineffective work. On this basis if a machine breaks down, the operator should not be penalized for the time he loses. He is there and ready to work, and if the breakdown was not his fault, he justly feels that he is entitled to

compensation. The management on the other hand should not be expected to pay for defective work.

Some points are not so easy to decide. For example, should a man be paid for time spent receiving medical services during working hours? The company perhaps provides free medical attention. It is not to blame when a worker becomes ill if the ailment is not of an occupational nature. On the other hand, the man is usually not to blame either. If he is not paid for time spent at the medical department, he is likely to put off reporting until the illness develops enough to cause lost time which is expensive to the company. If the company does pay for trips to the medical department, certain individuals may take advantage of this and go unnecessarily. If payment is to be made, what is the proper rate, the base rate, the incentive rate, or the earned rate?

Questions like these must be settled after a discussion of all angles. The particular one cited is handled differently by different organizations. In general, it appears that a policy which leans towards liberality is the best. The amount at stake is not large even though in large organizations it may reach a sizable total. Usually a just policy which gives the worker the benefit of the doubt gives good returns in the form of increased loyalty and satisfaction, and abuses are rare and easily checked with proper supervision.

This is the final article of the present series. If it has served to give a clearer understanding of the component parts of the methods engineering procedure and if it has shown in some degree that beneficial results to men and management are obtainable when the procedure is competently applied, the purpose of the series will have been accomplished and the labor required for its preparation will have been amply justified.



# TITAN

## Twist Drive

revolutionizes  
QUICK CHANGE EQUIPMENT

At last a positive drive for straight shank drills that greatly increases the many advantages of quick change equipment.

#### Spring Tension Chuck Ring

An exclusive feature of the TITAN Quick Change Chuck. The spring confined in the ring keeps it in place over the driving balls, locking the collet in position for positive drive at any angle.

#### Twist Drive On Flutes Of Drill

Two hardened steel balls in the collet drive against the flutes of the drill, eliminating slippage and scored shanks.

#### Use Any Standard Straight Shank Drills

Save the high costs of special and taper shank drills and the time required to prepare them for other drives.

Quick Change Twist Drive Equipment is easily installed on any portable electric or air drill. Instant changes without shutting off the power.

Prevents much drill breakage especially on smaller drills. Permits using any part of a broken drill as conveniently as a new one.



Chuck your drills as simply as this.



Portable electric or air drill application.

When ordering No. 10 TITAN Quick Change Chuck and Twist Drive Collets for portable or electric tools, please specify name and make of the tool and number of jaw chuck now in use.

**TITAN TOOL CO.**  
FAIRVIEW, PA.



Cleveland Public Auditorium

## National Metal Show

*Four acres of floor space devoted to modern developments in the field of metals.*

THE nineteenth National Metal Exposition will be held at the Public Auditorium in Cleveland, Ohio, from October 19 to 23 inclusive. For the past eighteen years this annual industrial exposition has been staged and sponsored by the American Society for Metals. This year the following four societies are cooperating: American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Welding Society, and The Wire Association.

The National Metal Show will be the one important exposition of the year to engineers, manufac-

turers, plant executives, and others in vocations that are allied with metal manufacturing. At the time of going to press, space has been contracted for by 210 manufacturers, the space contracted for amounting to 169,000 square feet, or nearly four acres. Among these 210 exhibits the visitor to the Exposition will find demonstrations of various kinds and types of new products along the line of metals or alloys, laboratory equipment, modern metal-working machinery, the latest welding equipment, various types and kinds of ovens and furnaces, and other interesting developments.

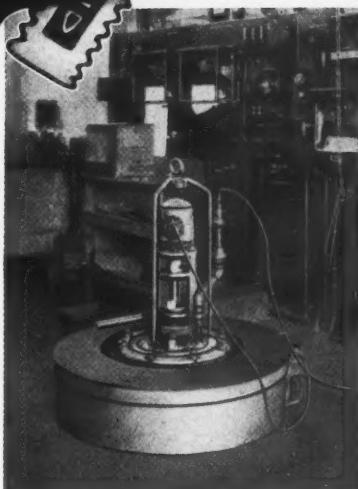
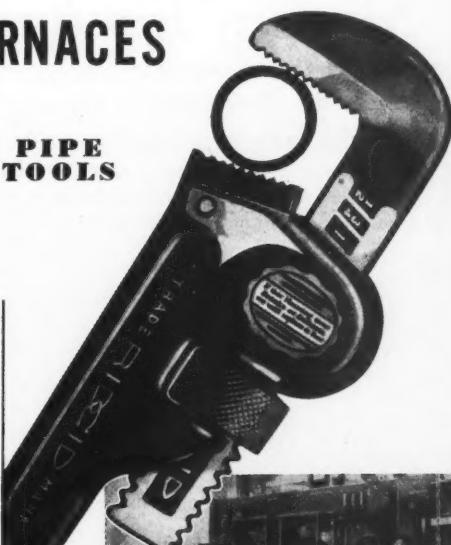
# HEVI DUTY FURNACES

AND

**RIDGID PIPE TOOLS**

The Ridge Tool Co., makers of the famous RIDGID wrenches and other fine pipe and threading tools, use a Hevi Duty Vertical Retort Carburizer in their heat treating operations because of its rapid penetration, its consistent production of controlled, uniform cases and its marked economy over other methods. Many other nationally known manufacturers have had similar experience in the use of this furnace.

Send for Bulletin 931A.  
It describes the Electrical  
Vertical Retort Carburizer



Hevi Duty Vertical Furnace in the plant  
of The Ridge Tool Co., Elyria, Ohio

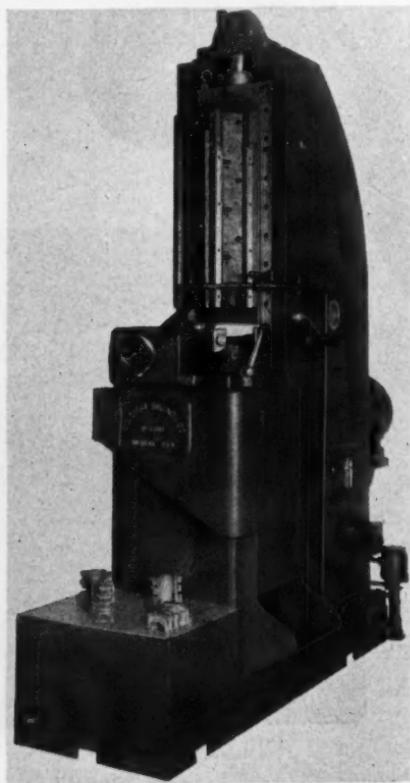
## HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES **HEVI DUTY** ELECTRIC EXCLUSIVELY  
MILWAUKEE, WISCONSIN

## Modern Equipment at Work

### **Broaching Integrally Cast Main Bearing Caps**

**F**OUR main bearing caps, cast in one piece, are finish broached from the rough on a single ram machine by



On this Colonial Broach, Four Main Bearing Caps are Finish-Broached Simultaneously from the Rough.

one automobile manufacturer, the bearing caps being cut apart later. For this operation a single ram, 15

ton Colonial broaching machine is used, equipped with broaches for performing all necessary operations in two positions of the fixture.

On the left side of the machine are the Colonial broaches for finishing the joint faces of the castings and flat sides. Following this operation the cap assembly is moved to the right hand side of the fixture for the broaching of two slots in the oil slinger ram.

Production is 400 pieces per hour, the castings having an over-all length of 5½ inches. Location for the second part of the operation is from the previously broached surfaces bearing against hardened and ground blocks.

### **Cutting Large Internal Gears on a Shaper**

**T**HE large circular work-piece shown in the illustration contains an internal gear having a 90-inch pitch circle, 2-inch face, and 4-pitch teeth. Inasmuch as the small quantity of these pieces which are machined at a time does not justify the purchase of a special gear cutting machine, the cutting of the teeth presented a problem until it was discovered that the operation could be performed in a Rockford Hy-Draulic Shaper.

The gear is of very tough steel, consequently the operation is divided into three stages—gashing, forming, and finishing. Specifications require that the tooth form shall not be lapped or otherwise finished after machining, and that no tool marks of any kind shall be visible on the finished surfaces. These rigid requirements have resulted, in the past, in a large percentage of rejections on



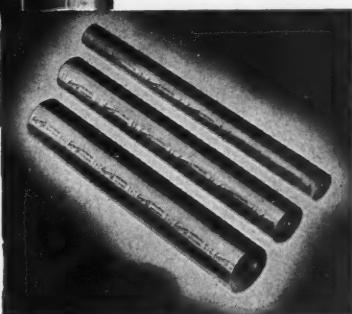
## -Saving You Time and Money

• Not only better bearings and bearing metals are provided by Bunting's standardized products, but also valuable advantages in cost and convenience. Practically every production and maintenance need is met by Bunting Brass & Bronze Standardized Bearings. There are over 600 sizes.

The labor and material saved in cutting Bunting 13" Cored and Solid Machined and Centered Bars renders cost of metal negligible. Bunting Babbitt metals for both industrial and high speed applications bring definite new advantages to all who use them. Here are perfected products at the irreducible minimum of cost plus a no less valuable service. The Bunting Brass &

Bronze Company, Toledo, Ohio.

Branches and Warehouses in All Principal Cities.

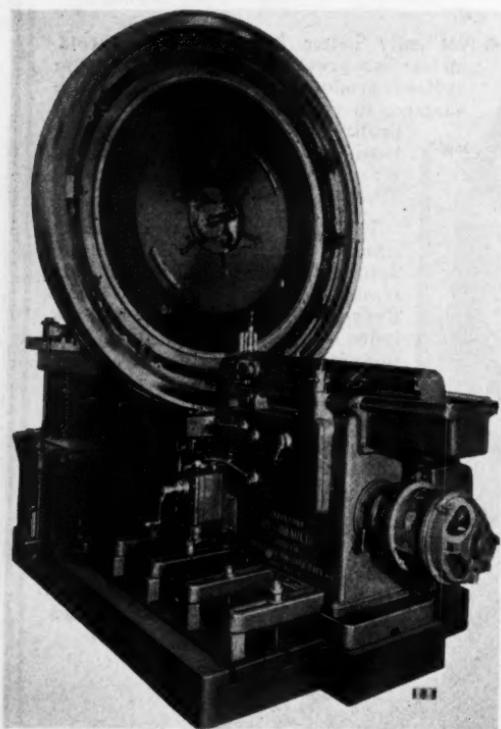


Write for catalog showing sizes and prices of Bunting Standardized Bearings and other ready-to-use products.

**BUNTING**  **Quality**  
**BRONZE BUSHINGS • BEARINGS**  
**MACHINED AND CENTERED BRONZE BARS**  
**ANTI-FRICTION METAL**

these costly parts, due to marks left on the surface by the tools and which were unavoidable by the machining methods employed.

In the set-up shown in the illustration, the work-piece is mounted on the arbor of a highly accurate index-



Using a Hy-Draulic Shaper to cut an internal gear having a 90-inch pitch circle.

ing device, and the indexing head and the shaper are mounted in accurate relationship on a heavy base. In the finishing operation an extremely fine finish is obtained due to the fact that the ram is driven by hydraulic power and thus there are no gears or other mechanical elements which might tend to transmit impressions to the surfaces. The high return-ratio, the quick shockless reversals, and the

uniform cutting speed are factors which have combined to increase production on this job. The accuracy and exact control are demonstrated by the fact that the cutting tools run into a very narrow groove at the forward end of the shaper stroke.

It is interesting to note that the Hy-Draulic Shaper used in this unusual operation is standard throughout, requires no special preparation aside from accurate mounting, and can immediately be set up for a wide variety of operations when this operation is completed.

**McCASKEY PERPETUAL INVENTORY CONTROL.** This four-page circular, issued by the McCaskey Register Company, Alliance, Ohio, describes the McCaskey system of perpetual inventory control and illustrates the several forms and other equipment required in the operation of the system. Inasmuch as the annual cost of an inventory is estimated at approximately 10 per cent of the total investment, any system which will aid the manufacturer to keep this inventory at the lowest point at which efficient operation is possible is a valuable asset to his business. The advantages of the McCaskey perpetual inventory control system as explained in the circular include an immediate balance available with minimum of clerical work, no record delays resulting from repeated posting of data, prompt detection of slow-moving items, constant check of excessive or obsolete stocks, elimination of frequent physical inventories, ease of adaptation to unusual inventory requirements, and other. Copy free upon request.

**"HANDLE MATERIALS VIA LO-HEAD"** is the title of a folder now being issued by the American Engineering Company, Philadelphia, Pa., and describing the quarter-ton, half-ton and one-ton monorail hoists and stationary hoists made by this firm. Included also are tables of capacities and ratings. Copy free.

IT PAYS TO STANDARDIZE ON  
**STARRETT**  
**TOOLS**

It pays in fewer rejects, in faster production, in lower costs. Write for the new revised edition of Starrett Catalog No. 25 M. D. and the Special Dial Indicator Catalog. Your distributor stocks Starrett Tools—buy through him.

**THE L. S. STARRETT CO.**  
 World's Greatest Toolmakers  
 Steel Tools—Standard for Accuracy  
 ATHOL, MASS., U. S. A.

**Use Starrett Tools**

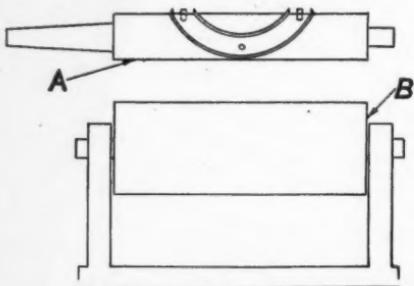
## Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

### Tools for Cutting Gaskets on the Milling Machine

By T. J. HORAN

EXECUTIVES of plants manufacturing such products as gas engines, air compressors, or similar mechanisms in quantities that are not too large may be interested in the



Drawing of Milling Machine Tool for Cutting Gaskets

simple, yet efficient, gasket cutting tool illustrated herewith. Instead of using a stamping press, this tool is designed for use in a milling machine, and, while simple and inexpensive to make, is highly efficient.

The gasket cutter consists primarily of a steel roller having two oval cutting edges as shown at A. To determine the location of the cutting edges, a gasket pattern should first be made; a thin piece of sheet copper will serve the purpose adequately. The next step consists of turning a cold rolled shaft to a circumference dimension which corresponds to the overall width of the copper gasket pattern. A shank with a No. 10 B

& S taper should then be cut on the end of the shaft which is to be inserted into the spindle of the dividing head. The copper gasket pattern is rolled to fit the curvature of the shaft and a line is drawn on the shaft around the outer and inner edges of the pattern.

The shaft is then swung between the dividing head center and the milling machine tailstock center and, using an angle cutter so as to provide the necessary backing for the cutting edge, the material on either side of the pattern lines is milled to a depth of  $3/32$  in. Holes which accommodate small plugs for punching holes in gasket material are drilled as designated by the gasket pattern. Either filing or grinding the cutting edge of this gasket tool insures clean-cut gaskets regardless of the kind of material used.

To obtain the necessary pressure, the material is pressed between the gasket cutter roller A and the roller B, which is of larger diameter. The roller B is covered with a sheet of lead which, while sufficient to support the material, will not injure the cutting edge of the tool. The ease with which the gaskets can be cut compensates fully the time and effort expended in making the cutter.

### Right Angle Drill for Small Bores

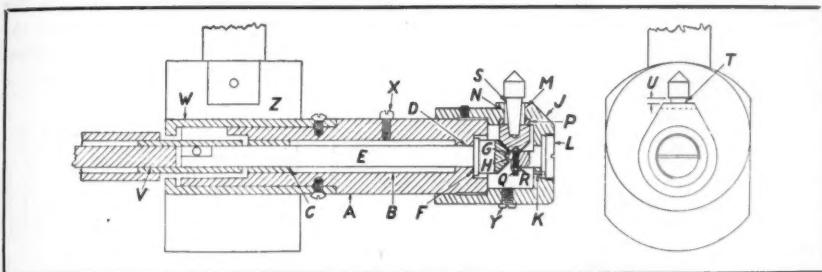
By JOHN A. HONEGGER

A DESIGN of a right angle drill for small bores which can be used in limited areas on work in the

toolroom or job shop is shown in the drawing herewith. The drill can be used in a lathe and consists primarily of the housing A enclosing the shaft E which drives the set of bevel gears in the housing J.

Housing A is bored out at B to accommodate bushing C, which is a press fit in the housing. The bore in bushing C is in alignment with the

tapered shanks of small drills, countersinks, burrs, grinding wheels, and so on. As no provision is made for knocking the tools out, a slight shoulder is cut on each tool as indicated at T, leaving space for the insertion of a U-shaped flat extractor. Using the extractor as a miniature crowbar, the tools are readily lifted out of the holder.



Cross-Section Drawing of Right Angle Drill for Small Bores

bore in housing A at point D. Bushing C and bushing D together form the bearing for driveshaft E. One end of driveshaft E is shouldered and turned to the correct size to form one of the bevel gears. In one direction, the combination shaft and bevel gear is confined by the thrust washer F while in the other direction it is confined by the hardened steel conical point G which bears into the conical depression H of the shaft E.

As will be noted, the conical bearing G is integral with the retaining plug L which is made to snugly fit the right angle housing J and is oriented by means of the lock-pin K.

At right angles to the shaft E is the combination shaft and bevel pinion M which has a bearing at N and is confined in one direction by the thrust washer P and in the other by the hardened cone point set screw Q which is adjustable and can be clamped by the check nut R. A taper hole is drilled and reamed in the shaft M as indicated at S to receive the

A flexible shaft is attached at V and is held in place by means of the cap W. Fillerplugs X and Y have been provided for the purpose of oiling the bearings.

One type of holder for holding the drill on a bench lathe is shown at Z. Although in this case only a short drilling attachment was used, the extension cap W can be of various lengths depending upon the type of drilling to be done.

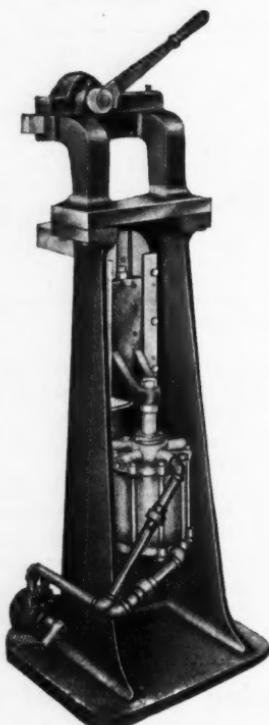
## Reducing the Cost of Making Hook-Bolts

BY L. E. HALPIN

HOOK-BOLTS for jigs and fixtures are handy devices but their main drawback to more widespread use is the expense involved in making them. This expense, however, is cut to the minimum when the procedure described here is followed, and the usual method, of either upsetting round stock to make

# MARKING

## FLAT—ROUND IRREGULAR SURFACES BY ROLLING OPERATION



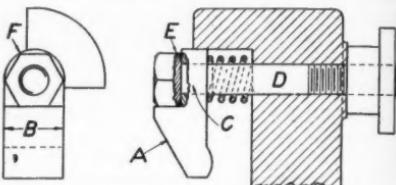
### MODEL 25 HI-DUTY MARKING MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

**GEO. T. SCHMIDT, Inc.**  
1806 BELLE PLAINE AVE.  
CHICAGO, ILL.

the bolt-heads or machining them out of rectangular stock, is unnecessary. A welding torch was used with good effect in making this type of hook bolt.

A long section of 1x1-in. flat stock was cut to length for the bolt-heads, indicated at A, then each head was milled on one side for the bolt head and on the opposite side for clearance. A hole was then drilled for the standard hex-head bolt D and the head and bolt were welded together, as indicated at E. A concave radius



Design of Welded Hook-Bolt

cutter was used to mill the curvature at F to make the bolt ready for use.

If desired, the bolt hole C can be drilled and a number of the hooks strung together upon a suitable arbor, which can then be clamped into a milling machine vise and the radius F gang milled.

### Simple Extractor for Headed Keys

By WILLIAM HALLIDAY

THE ordinary type of headed key used in locating and fastening pulleys and gears can be easily withdrawn from a locked position in a shaft and wheel with the simple extractor shown in the illustration. Although this extractor is similar in principle to many other devices serving this same purpose, simplicity of design and construction makes this one very practical.

A headed key of the type which is

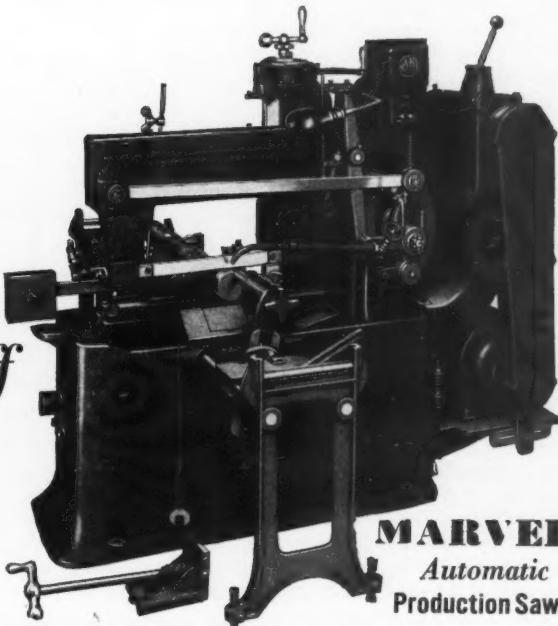
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**Solve  
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Cutting-Off  
Problem**



**MARVEL**  
Automatic  
Production Saws

Cutting-off in a lathe has always been a slow and costly operation, hard on tools and wasteful of stock. With today's automatic, high-speed MARVEL Saws it has become an easy, fast operation, especially when cutting quantities of identical pieces from bar stock.

Requiring no more attention than an automatic screw machine, the new MARVEL Nos. 6A and 9A Production Saws will feed to length and cut-off diameters up to 10 inches at the rate of 10 pieces of 6" round or 160 pieces of 1½" round every hour floor to floor.

With unbreakable High-Speed-Edge Hack Saw Blades that are but a fraction of the width of a cutting-off blade, chip loss between pieces is materially reduced and the number of pieces per bar increased.

Built by MARVEL, the pioneer builders of automatic bar push-up sawing machines, and strictly heavy-duty with full ball bearing construction, these saws have completely solved the "cutting-off problem".

*Write for Bulletin 600*

**ARMSTRONG-BLUM MFG. CO.**

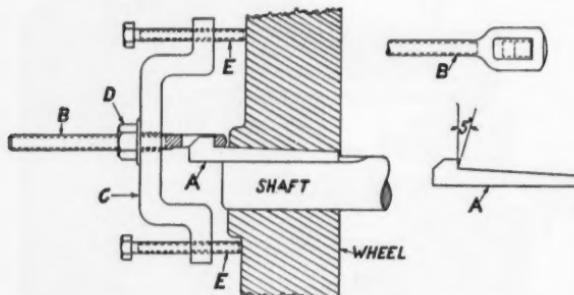
*"The Hack Saw People"*

45 N. Francisco Ave.,

Chicago, U. S. A.



often very difficult to remove is shown at A. A threaded stud having one end flattened and formed into a loop can be seen at B. To insure a strong



Extractor in Position to Draw a Headed Key

hook loop the rounded end is welded to the straight shank of the stud. C shows a specially shaped strap which is formed of heavy steel stock. In the center of this piece a hole is drilled with sufficient clearance so

that stud B can be passed through it. The nut D shown on the stud E is hardened to withstand the thrust when the extraction is performed. A

hardened and ground thrust washer is placed between nut D and the face of strap C to prevent excess wear. Two screw holes are drilled in strap C for the screws E.

To remove a headed key, the looped end of the threaded stud is placed over the head of the key and screws E tightened until they are in contact with

the surface of the wheel. One or two turns of nut D are sufficient to loosen the key from the locked position. Low cost and simplicity of design are the features of this extractor.

## Nibble the Costs

With a multiple purpose  
**SAVAGE NIBBLING MACHINE**

Hours the ordinary way

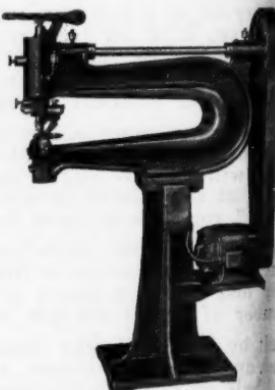
vs.

Minutes with a Savage Nibbler

For cutting shapes and duplicate parts to a scribed line or by guide template. Will cut chrome-nickel sheets and other tough alloys.

**No Distortion — No Oxidation  
No Secondary Operations**

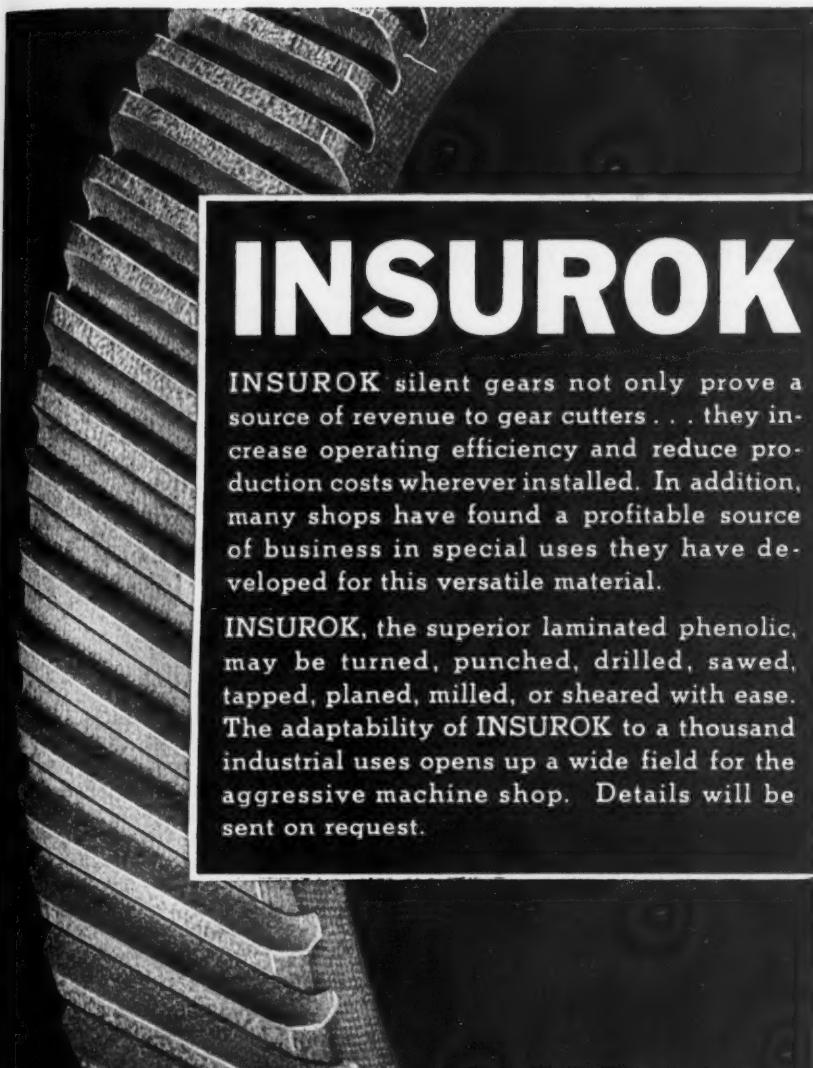
Capacities to  $\frac{1}{8}$ " — Throat depths to 36".



No. 130 —  $\frac{1}{8}$ " capacity.

PIONEER MANUFACTURERS OF NIBBLING MACHINES

**W. J. SAVAGE COMPANY**  
KNOXVILLE SINCE 1885 TENNESSEE



# INSUROK

INSUROK silent gears not only prove a source of revenue to gear cutters . . . they increase operating efficiency and reduce production costs wherever installed. In addition, many shops have found a profitable source of business in special uses they have developed for this versatile material.

INSUROK, the superior laminated phenolic, may be turned, punched, drilled, sawed, tapped, planed, milled, or sheared with ease. The adaptability of INSUROK to a thousand industrial uses opens up a wide field for the aggressive machine shop. Details will be sent on request.

## The RICHARDSON COMPANY

FOUNDED 1858

MELROSE PARK, ILL.

*Detroit, Mich., 4-252 General Motors Bldg., Madison 9386*

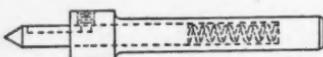
*New York, N. Y., 75 West Street, Whitehall 4-4487*

NEW BRUNSWICK, N. J.

## Spring Plunger Centers

BY WM. C. BETZ

ONCEANALLY a job is encountered which requires tapping with an unusually large tap that must be guided to insure that it will enter the work straight. Such jobs are often done in an engine lathe, using



Spring-Plunger Centers for Use in Hand Tapping in the Machine

the tailstock center to hold the tap in alignment. In such a case, the tailstock must be adjusted continuously as the tap is fed in or reversed to free the teeth of chips. This is very inconvenient, due to the fact that the workman must revolve the tap with one hand and the handwheel with the other in order to keep the tailstock center in the center hole in the rear end of the tap.

To overcome this inconvenience at the Fafnir Bearing Company's plant, spring-actuated centers like those shown in the illustration are used. The center with the tapered shank is made to fit the tailstock of an engine lathe, and the one with the straight shank is for use in a standard drill chuck.

Having replaced the usual tailstock

center with the spring-actuated center, the tap is placed in position and the spring center is fed into the center-hole in the tap-shank so that the spring in the center is compressed to within  $\frac{1}{8}$  inch of full compression.

No adjustment of the handwheel is necessary when reversing the tap a half-turn to loosen the chips, and only occasional adjustment is required as the tap is fed into the work. Thus a great deal of time is saved and the danger of pulling the work-piece loose in the chuck is minimized.

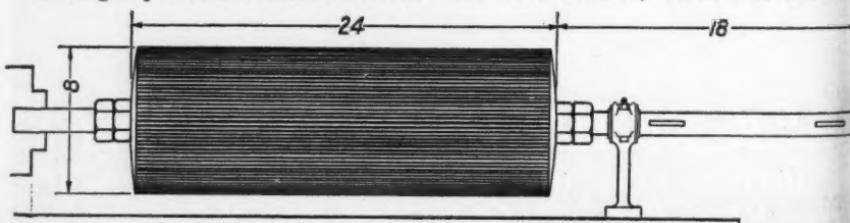
The straight-shank center may be used in a drill press or milling machine to guide a tap into a hole in the same manner as it is done in the lathe, the center being held in an ordinary drill chuck.

## Steadyrest for Long Indexing Jobs

BY MERRILL E. BROWN

WE were recently called upon to remachine a glue spreading roller upon which the corners of the lands between the grooves had become so rounded through years of use that the roller would no longer feed the veneer through the machine as it applied the glue. The roller, which was of cast iron, was 8 in. in diameter by 24 in. long, and contained 100 grooves  $\frac{1}{8}$  in. wide and the same deep.

To recondition the roller, it was necessary to turn it down to eliminate the worn corners, which was done in



Drawing of glue spreading roller mounted in steadyrest made from Ford connecting rod.

---

**STRONG — STURDY — FAST CUTTING  
INDIVIDUALLY TESTED—GUARANTEED**

# **RED TANG FILES**

**The Red Color Trade Mark now enables  
you at a glance to select these high qual-  
ity Files. Sold by leading Supply Dealers.**

**Simonds Saw and Steel Co.**

*Established 1832*

**FITCHBURG, MASS.**

---

**CHICAGO, ILL.**

a lathe. Upon setting the roller on a milling machine to re-cut the grooves, however, it was found that the shaft was too long to be swung between the centers of the miller, consequently it became necessary to handle the job as shown in the illustration.

One end of the shaft was clamped to the face plate of the dividing head, as shown, and the other end was held in a steadyrest made from a Model T Ford connecting rod.

The rod, which had a bearing diameter of  $1\frac{1}{4}$  in., was cut off  $4\frac{11}{16}$  in. from the center of the babbitted end. The cut end was welded to the center of a cold rolled plate  $\frac{5}{8} \times 2 \times 6$  in., and the bottom machined parallel to the line of the bearing. The shaft was lined up with the table, and the steadyrest bolted down. During the cutting of grooves, no difficulty was experienced from chatter.

One advantage of this steadyrest is

in the ease of assembling both the work and the rest. A steadyrest of this type has been found practical because it holds the work firmly, and because work can be removed and replaced at any time merely by loosening the two rod bolts and removing the rod cap.

The reason most people do not recognize opportunity when they meet it is because it usually goes around in overalls looking like hard work.

**NORDYKE SERVICE ELEVATOR BULLETIN.** Allis-Chalmers, Milwaukee, Wisconsin, has prepared an excellent leaflet 2226 on its Nordyke Service Elevator of the continuous moving step type. It gives a well illustrated description of how interfloor travel for employees and products can be expedited in flour mills, grain elevators, garages, food plants, power plants, or in any building consisting of two or more floors. Many interesting applications and uses are cited for this compactly designed, ruggedly constructed and easily installed equipment. Copy free on request.

## CUTTING OFF SCRAP ENDS

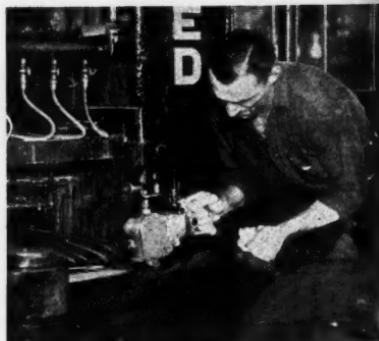
A Stanley No. 144 Unishear was selected as the fastest and most practical method of trimming off the scrap ends of this heavy gauge cold rolled strip. No other method of cutting can match it for speed and economy.

Another example of the exceptional opportunities for saving time and money offered by Stanley Unishears wherever sheet metal is to be cut.

Ask your Stanley Distributor for a demonstration or write for full description.

**STANLEY ELECTRIC  
TOOL DIVISION  
THE STANLEY WORKS  
New Britain, Conn.**

**STANLEY UNISHEARS** A COMPLETE LINE of PORTABLE AND STATIONARY MODELS



Stanley Unishear No. 144 has a capacity of 14 gauge H.R. Steel. Cuts any shape with hair line accuracy.

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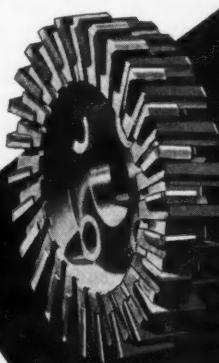
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TABLE  
DELS

# INGERSOLL ZEE LOCK

## Face Mills

No. 21—Medium Duty. For finishing operations. (Cuts up to  $\frac{1}{4}$ " in depth).



No. 21-XX—Extra heavy Duty. For heavy roughing operations. (Heaviest roughing cuts).

No. 21-X—Heavy Duty. For general purpose roughing or finishing (Cuts up to  $\frac{1}{2}$ " in depth).

USES THE POSITIVELY LOCKED DOUBLE ADJUSTABLE INGERSOLL ZEE LOCK CUTTER BLADE OF HIGH SPEED STEEL, SUPER-HIGH SPEED STEEL, STELLITE OR CEMENTED CARBIDE.

The cutter is complete in itself. No additional parts are required when resetting. The cutter blade resets mostly outward in the major direction of wear and slightly forward on its face. It is easily reset as the serrations and wedges automatically reset the blade without any additional devices. The Ingersoll Milling Machine Co., Rockford, Ill., U.S.A.



HAVE INGERSOLL ENGINEER YOUR CUTTERS  
WRITE FOR NEW INFORMATIVE INGERSOLL CUTTER CATALOG

## Over the Editor's Desk

### Going Up!

AFTER a few weeks during which business in general took a slight drop, the business barometers show that it is again on the rise. The demand for durable goods continues strong, and there is plenty of money available at low rates. Banks are, according to a leading financial paper, "bulging with reserves and are stronger statistically than they ever were before." The increase in the volume of business over September a year ago promises to be approximately 15 per cent.

Building operations are continuing at a considerable advance over last year's figures. Machinery buying is active, and purchases of electrical and railroad equipment are steadily increasing. There has been practically no "summer slump" this year in the steel industry, and the automobile output promises to be the highest since 1929. Factory sales of members of the Automobile Manufacturers Association during the first eight months of this year were 27 per cent above the same period of 1935, and 80 per cent above the five-year average for the period.

Buick Motor Division of General Motors Corporation has appropriated \$14,500,000 for new factory buildings, machinery and tools to step up production. This expansion follows upon an expenditure of \$15,000,000 for the same purpose a year ago, and will increase plant capacity from 800 to 1,000 cars a day. The Pontiac Motor Company has just spent \$6,000,000 for equipment for a new axle plant which will add 850 men to the factory payrolls.

Hendey Machine Company reported earnings during the first half of 1936

of almost triple the figure for the entire year of 1935. The Westinghouse Electric & Manufacturing Company has had more employees on the payrolls of some of its plants this year than ever before. Production of the Indian Motorcycle Company is 25 per cent better than last year and 55 per cent ahead of two years ago. The improvement in the heavy industries is facilitated by the high level of bank deposits and the prevailing low rates of interest.

According to C. R. Hook, President of the American Rolling Mill Company, the steel industry today is providing employment for nearly 32,000 more men than in 1929, and average wage rates in the industry are currently above the 1929 level. The most important factor in raising steel employment above the 1929 average has been relatively greater demand for the highly-finished light steel products.

Orders received by the General Electric Company during the first nine months of this year amounted to \$211,891,038, compared with \$158,943,765 during the same nine months last year—an increase of 33 per cent.

Public Works Administration has ceased allotting funds for PWA work in Texas, it having been discovered that there is no more skilled labor available. Reports from New Hampshire and parts of Iowa indicate an actual shortage of workers, and one of the great automobile companies has mentioned an impending shortage of skilled labor in its advertising.

Stock prices are steadily advancing due to liberal dividend policies as a result of the upward trend of corporate earnings and pressure of tax legislation. Despite drought losses and higher food prices, the total consumer purchasing power is much higher than a year ago, indicating a continuation of good business in the retail trade.

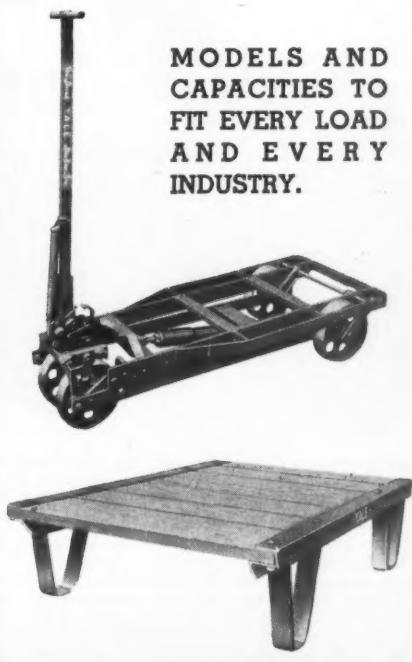
# HERE'S ONE TAX *you CAN ELIMINATE*

**Y**OU may be paying a tax on materials handling. Frequently the lifting, hauling and storing of goods — an unproductive yet essential operation in every industry — add excessive costs to production. Inefficient methods slow up plant operation and make it difficult to meet competitive prices without losing money on orders.

The difference between the operating cost of a Yale Hand-lift Truck System and that of antiquated equipment (often Yale shows a saving as high as 80%) is a tax on your business.

Examine your materials handling methods and see if you are being needlessly taxed. A Yale Engineer will gladly

assist you in your survey and recommend equipment that will serve you most efficiently and economically.



MODELS AND  
CAPACITIES TO  
FIT EVERY LOAD  
AND EVERY  
INDUSTRY.

THE YALE & TOWNE MFG. CO.  
Philadelphia Division, Phila., Pa., U. S. A.

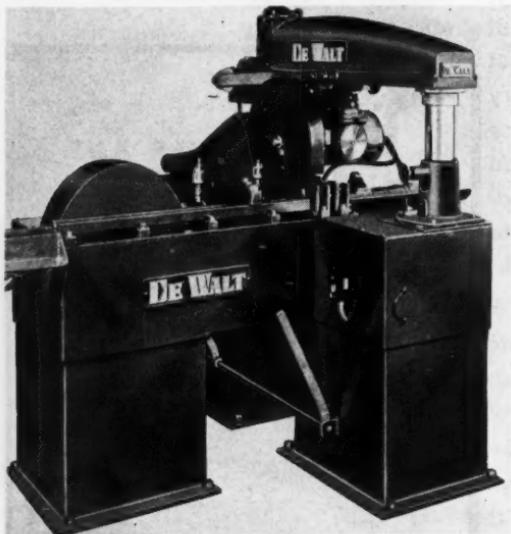
TRADE

**YALE** TRADE MARK

## New Shop Equipment

### DeWalt Automatic Metal Cutter for Light-Section Material

A new, semi-automatic metal cutting machine designed for cutting any light section material which can be cut with metal cutting saw blades is now being manufactured by DeWalt Products Corporation, Lancaster, Pa. After the mate-



**MATERIAL.**—This machine will cut light wall tubing, 2-in. diameter, in 6-in. lengths, at the rate of 28 per minute or a little more than 2 seconds per cut.

rial has been started into the feed jaws, it is automatically pushed against a length stop, clamped simultaneously on both sides of the saw kerf by a four-jaw automatic vise, and then cut off. The saw then draws back, the stop lifts, the stock feed mechanism pushes another section of the material into the vise, displacing the stock cut off, and the process is repeated. This machine will cut off light wall tubing 2 in. in diameter and 6 in. long, for instance, at the rate of 28 cuts per minute, averaging a little more than two seconds per cut.

The machine illustrated was designed

primarily for cutting light wall tubing. It is equipped with a  $7\frac{1}{2}$  h.p. motor, driving a 16-in. hollow ground metal cutting saw blade at 3600 r.p.m.

All mechanical actions are powered from a single 1 h.p. motor, driving through a variable speed type V-belt pulley and equipped with a slip clutch so that the machine action is under convenient control of the operator at all times. By means of a simple double crank, the saw motor is fed along the arm, with an arrangement for adjusting the forward position in proper relation to the material being cut.

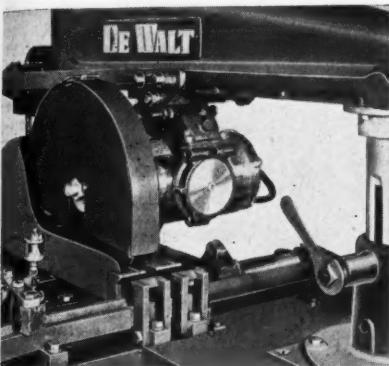
The material itself is fed into the automatic vise by means of a crank operating through a cross head to give a straight line movement. The length of material fed is controlled by the throw of the crank, having a range of from 4 in. to 13 in. in the machine illustrated. For cutting off extremely long pieces, the operation of the machine may be slowed down.

The stock feed jaws are driven through a compression spring arrangement, designed chiefly to insure position against the stop at the time the stock is gripped in the vise, but also to eliminate damage to the machine if the incoming material fails to feed for any reason. These semi-floating jaws grip the stock by means of a simple angular pinch, so arranged that the center line of the stock is always on a fixed line of the machine.

The vise is made of four self-equalizing clutch jaws, two on each side of the saw kerf. Operation of the vise is entirely automatic and the grip is secured by means of a toggle mechanism. The jaws are controlled by a compression spring which eliminates the tendency to crush light wall material. In order to regulate the length of material cut, an automatic length stop is employed. The stop construction is very rigid so that the length of the series of pieces can be kept within very close limits. All jaws and stop pads have been hardened

to withstand wear in service.

Machines can be built on this same principle for very general applications.



This close-up of the machine shows the automatic stock feed jaws, the 4 clutch jaws of the self equalizing vise and the automatic length stop. All mechanical actions are powered from a 1 h.p. motor, driving through a variable speed type V-belt pulley.

Completely automatic equipment, including a device for feeding the material from a magazine onto the extension support is available. Included with all automatic machines is a roller type extension support for incoming material.

Particular attention has been given to enclosing and guarding the machine. The top of the frame is covered to keep the chips and grit from the working parts. Three control stations are provided, one at each side of the machine and the third at the front of the material support.

### Sampson No. 0 10-Inch Stroke Precision Shaping Machine

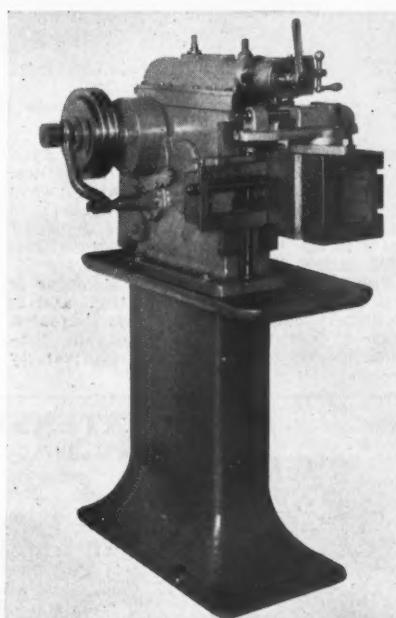
The illustration shows the Sampson No. 0 10-Inch Stroke Precision Shaping Machine which is now being marketed by Sampson Tool Co., Inc., 101 Walker St., New York, N. Y. The machine has several outstanding features, such as a fully enclosed reduction gear box and extended clutch and gear box levers. Variable self-acting longitudinal and vertical table feeds are provided in either direction. The extended gear box and clutch operating levers allow the operator to obtain fine adjustments of the ram when setting up the machine, insuring the maximum of convenience for the operator. Two ram speeds are avail-

able; 29 and 52 strokes per minute.

The table is of the swiveling type, which permits machining surfaces at any angle desired. The tool head also swivels in either direction to an angle of 60 deg. and is accurately indexed. The tool holder block and tool post swivel and the tool block can be locked with a plunger pin. The tool post has a positive cam-operated locking arrangement.

When in operation, the thrust on the ram is upward due to the tool pressure on the work, and is therefore in alignment with the slide bearing surfaces. As a result there is no tendency to bind, less loss of power, and less wear, and adjustment is required only at very rare intervals. The stroke is adjustable from 0 to 10 inches.

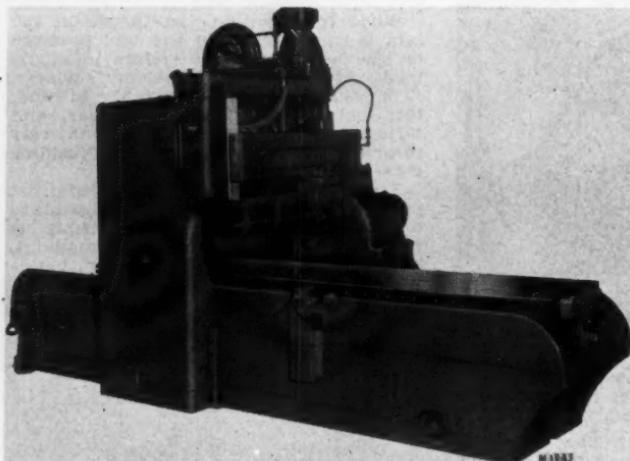
The machine is of extra substantial construction to eliminate the possibility of vibration and the workmanship is practically a tool room job throughout. Bearing surfaces are carefully hand-scraped to insure the maximum of bearing contact. The machine can be supplied for direct line shaft drive or with built-on motor. Both types are friction-clutch operated.



Sampson No. 0 10-Inch Stroke Precision Shaping Machine

**Sundstrand Hydraulic Rigidmil**

A "Rigidmil" Milling Machine having an automatic hydraulic operating cycle which includes actuation of the spindle head and clamping of both ends of the cross rail as well as hydraulic feed and rapid traverse of 72 in. in both directions of the table has been developed by the



Rigidmil with Automatic Hydraulic Operating Cycle

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill. One of the machines, set up to mill five intermittent keyways in eight heavy shafts simultaneously, is shown in the illustration. The depth of the cut on this job is held to within 0.002 inches.

The operating cycle of the machine is entirely automatic after starting, and is accurately controlled by easily adjusted dogs—a feature which makes the machine readily applicable to a wide variety

of work. The spindle head rapidly approaches the work, feeds to depth against an easily adjusted positive stop, and clamps hydraulically. The table feeds to a predetermined distance, then the head unlocks and rises, and the table advances to position for the next cut. This cycle is repeated until all keyways are finished, then the table rapid traverses to starting position and stops.

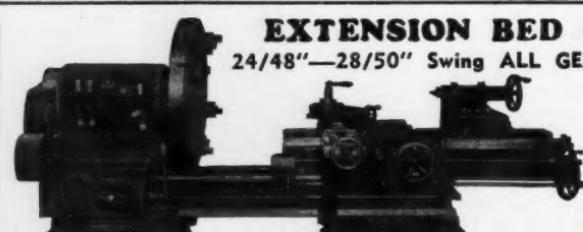
The Sundstrand hydraulic circuit is said to be equally effective in either direction and entirely suitable for climb cut milling. It is believed that this new machine provides one of the most complete examples of the successful application of hydraulic pressure to machine tool actuation that has yet been developed.

The machine is of the usual Sundstrand sturdy construction.

**Producto No. 2 Hand Miller**

The illustration shows a precision type hand milling machine now being introduced by The Producto Machine Company, Bridgeport, Conn., and which is said to be of an entirely new design. An outstanding feature of the machine is the unusually wide range of spindle speeds which are intended to aid in the performance of precision operations.

The design of the machine includes



**THE RAHN LARMON COMPANY**

**EXTENSION BED GAP LATHE**  
24/48"-28/50" Swing ALL GEARED OR CONE HEAD

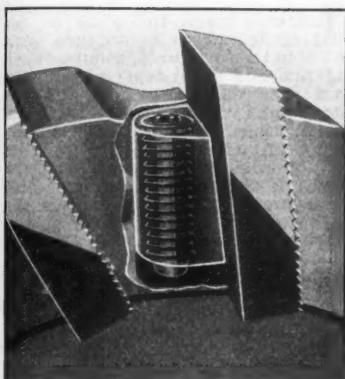
A lathe for small and large swing work. Long distance between centers. Three lathes in one. Saves space. Reduces cost.

*Write for literature.*

**Cincinnati, Ohio**

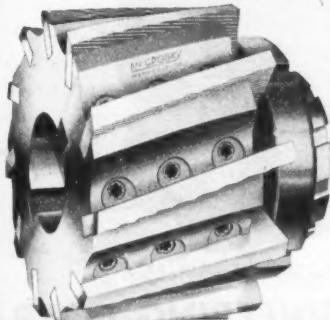
## Serrated Blades Locked without hammering

by McCROSKEY



• Inside View of JACK-LOCK Wedge in Serrated-Blade Tool . . . Tightening screw in wedge lifts wedge LIKE A JACK, forcing it over against the blade with a powerful compound wedging action. No hammering to lock or unlock . . . Send for Bulletin No. 15-F showing many examples of JACK-LOCK Serrated-Blade Tools specially engineered to cut costs.

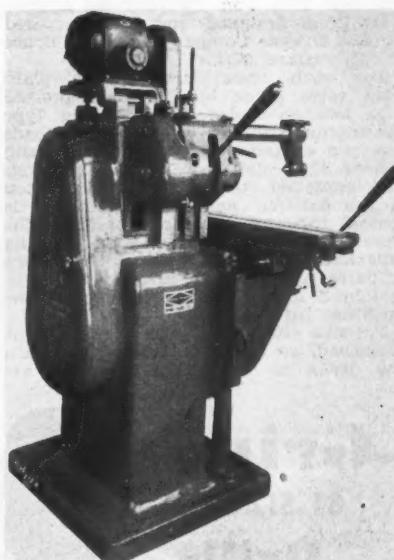
**McCROSKEY TOOL  
Corporation, Meadville, Pa.**



• Special Serrated-Blade Taper Reamer with McCroskey JACK-LOCK Wedges

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a one-piece column which, in addition to supporting the slides for the knee and cutter head, also provides for mounting the motor on the top of the machine and fully encloses the new style transmission. Six changes of spindle speeds are available through a transmission that is driven by V-belts and pulleys from the motor to the cutter spindle. Quick change arrangement for shifting the belt and locking after ad-



Product No. 2 Hand Miller

justment is provided. The usual range of spindle speeds is from 106 to 1050 r.p.m., but lower or higher ranges can be had.

The machine is known as the "Precision Type" because all slides are fitted with adjustable tapered gibbs, and all bearings are accurately fitted and scraped. A larger knee, saddle and table and cutter head are used. The cutter spindle rotates on Timken roller bearings with No. 40 National Standard Taper on the driving end. All shafts in the transmission rotate on ball bearings and all bearing shafts are properly lubricated.

The area of the base of the machine is 30x28 in.; height from floor to top of motor is 63 in. Working surface of table, 26x6 in. Feed of table is by 8-in.

hand lever or 20-in. crank lever. Cross feed, 7 in. Vertical feed, 15 in. Net weight of machine 1350 lbs. Motor required, 1 h.p.

### **Oilgear Five Ton Two-Column Pushemall Press**

Accurate assembly of plain valve guide bushings to a predetermined depth and at a known press fit is accomplished on a high production basis with the new Five Ton Two-Column Pushemall Press designed and manufactured by The Oilgear Company, 1405 W. Bruce St., Milwaukee, Wis.

For each press stroke, four plain solid valve guide bushings are pressed into two air-cooled single acting type gas engine cylinders. The operator loads the two cylinders into the fixture and inserts the solid valve guide bushings into hardened steel bushings in the top of the fixture. As the control lever is moved forward, the first half of the stroke of the ram raises the locating pins and the second half of the stroke actuates the control valve so that the crosshead moves downward to press the bushings into place.

Positive stops limit the stroke of the crosshead, so as to accurately maintain the depth to which the bushings are

pressed. When the crosshead strikes the positive stops, the control lever is released and the ram goes upward to starting position and automatically stops. The locating pins disappear so that the work can be removed.

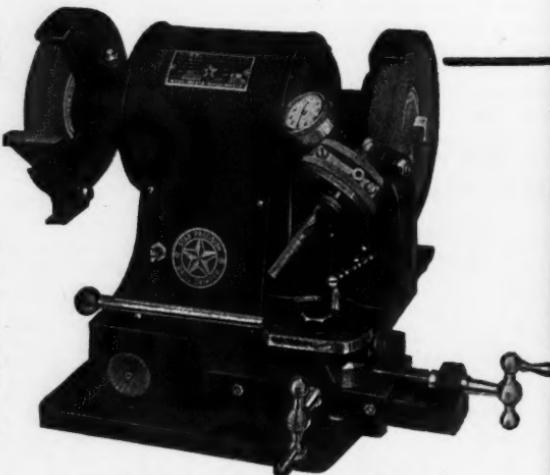
Built into the fixture attached to the crosshead is an automatic hydroelectric "tell-tale" in the form of a red light which indicates when the press fit for any bushing is not in accordance with predetermined specifications. Each pressing pin has its independent cylinder, ram arm, electric switch, and red indicator light. The maximum ram pressure in these small cylinders is controlled by an adjustable valve and is recorded on the gage attached to the crosshead. If the press fit on any valve bushing is not sufficient to depress the pressing pin and its respective piston  $\frac{1}{8}$  in. against a predetermined pressure, the tell-tale lamp indicates to the operator which bushing must be replaced.

The press frame is of all steel welded construction and encloses the pump, electric motor, valve, control mechanism and piping. A hat-type cylinder is flanged to the top of the frame and the maximum pressure in the system is recorded on the gage attached to the press frame. The crosshead is accurately guided on ways inside of the press

## **Grinds 81 SIZES OF Drills**

**No. 31 to  $\frac{1}{2}$ "**

**This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.**



*Write for descriptive folder.*

**STAR MACHINE & ENGINEERING CORP.**

*Division of Star Electric Motor Co.*

**BLOOMFIELD AVE.**

**BLOOMFIELD**

**NEW JERSEY**

BETTER THAN DAYLIGHT

Less eye fatigue  
means  
more profit



Painstaking application to mechanical detail promotes quality production. It also demands continuous use of the eyes—a condition which under poor light tends to fatigue the eyes, with resultant errors. Industry has found the solution—Cooper-Hewitt Mercury Vapor Light.

This restful, blue-green light reveals detail so sharply and makes focusing so much easier that workers no longer lose energy in the mere physical act of "seeing." Rejects are fewer and accidents and labor turnover

are materially reduced. Even handicaps from shadows are reduced under the Cooper-Hewitt system. Troublesome glare is eliminated and many of the losses hidden in cost sheets are wiped out by this detail-revealing light.

Better light means better sight, and less eye fatigue on the part of the workers means greater profits to management. Write for complete details. Address the General Electric Vapor Lamp Company, 827 Adams Street, Hoboken, New Jersey.

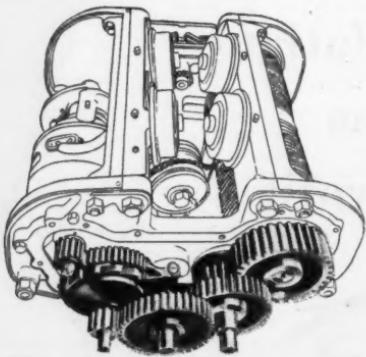
**GENERAL  ELECTRIC  
VAPOR LAMP COMPANY**

681C

**COOPER-HEWITT MERCURY VAPOR LIGHT**

*UNCOVER THE FACTS!*

Because of this . . .



a lift with LO-HED costs less

THE LO-HED hoist is so arranged that the motor and drum shafts are connected by a STRAIGHT LINE SPUR GEAR drive. The gears are the 20° stub tooth type, noteworthy for their great strength, long life, silence and friction freedom. Moreover, they're cut from drop-forged steel, heat treated, and operate in a sealed oil bath. Result—a saving in power. Every lift with a LO-HED is a fraction of a cent saved.



Division:

AMERICAN ENGINEERING COMPANY  
2451 Aramingo Ave., Philadelphia, Pa.

**A-E-CO LO-HED**  
*Hoist*

Other Products—A-E-CO Taylor Stokers, A-E-CO Hele-Shaw Pumps, Motors and Transmissions, A-E-CO Marine and Yacht Auxiliaries.

frame. An Oilgear Type C-411 pump with oil reservoir and a 3 h. p., 1800 r.p.m. electric motor arranged for tex-rope drive are enclosed in the press base. Both the platen and crosshead fixtures are removable so that the press can be used for other operations.

The normal capacity of the press is



Oilgear Five Ton Two-Column Pushemall Press

10,000 lbs. and the peak capacity is 13,000 lbs. The maximum stroke is 12 in. Pressing speed is 162 in. per minute and the return speed is 324 in. per minute. Floor space required, 35 x 25 in. Overall height, 7 ft., 10 inches.

**Bausch & Lomb Research Metallographic Outfit**

A research metallographic outfit has been completed in the laboratories of Bausch & Lomb Optical Co., Rochester, N. Y., which has complete equipment for work with bright field polarized light, and dark field. The magnifying range is from a low limit of 2.5X to the

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what you want and that's  
ton Wheels on your port-  
s a wheel for every kind  
air—a wheel that's fast  
For high speed grinders  
w speed—vitrified bond.  
bys—Alundum abrasive;  
onze and the like—Crys-



NORTON COMPANY,  
WORCESTER, MASS.

Please send a copy of your new booklet  
"Grinding and Finishing with Portable Equipment", which gives full information about the  
many applications for hand grinders and wheel  
specifications for all types of work.

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production line in large and small plants—making, shaping, polishing all metal products, alloys, glass, composition materials, wood, stone, etc.

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Fastest and most powerful tool for its type and weight ever developed. 25,000 r.p.m. Weight 12 ounces. Almost human in its smooth, rapid response. Try a HANDEE! Test for yourself its marvelous efficiency.

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M. M. S. — 6

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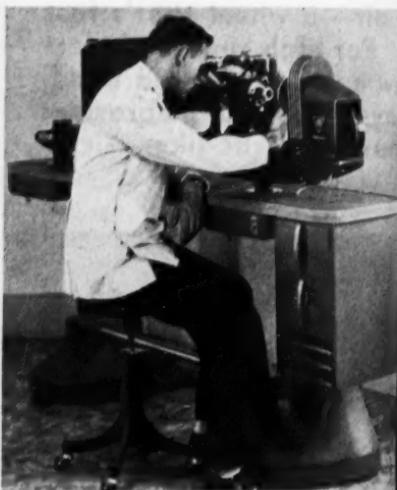
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highest magnification possible with oil immersion objective and high power eyepieces.

The equipment consists of the inverted microscope units, new and powerful illuminating system with either a motor driven arc lamp and resistance for use with direct current, or with tungsten arc lamp for use on alternating current, an 8x10 camera, with front and rear supports of metal and carried on a bar graduated to give bellows reading



Bausch & Lomb Research Metallographic Outfit

directly, a supporting bed carrying extension focusing rods on either side for coarse and fine adjustment of the microscope, a new stand with adjustable shock absorbers, a large cabinet for accessories and plate holders, and a cushioned stool which is adjustable for height.

The circular stage of the instrument is of the revolving type, 6 in. in diameter, giving a smooth, positive movement. The circumference is graduated in degrees and a lock can be provided to stop rotation when desired. The top plate of the stage is adjustable by a mechanical movement 1 in. in each of two directions, at right angles to each other, permitting the rotation of the specimen on center, which coincides with the field of the objective.

A new type of vertical illuminator serves not only for bright field work but as an analyzer and polarizer for

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★ The right hoist for you is the Wright. It's up-to-date and right—right in design, in quality and character of materials employed and right in performance.

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Tell your jobber's salesman about your hoist problems. When he explains the details of the Wright you too, will say, "This hoist is right!"

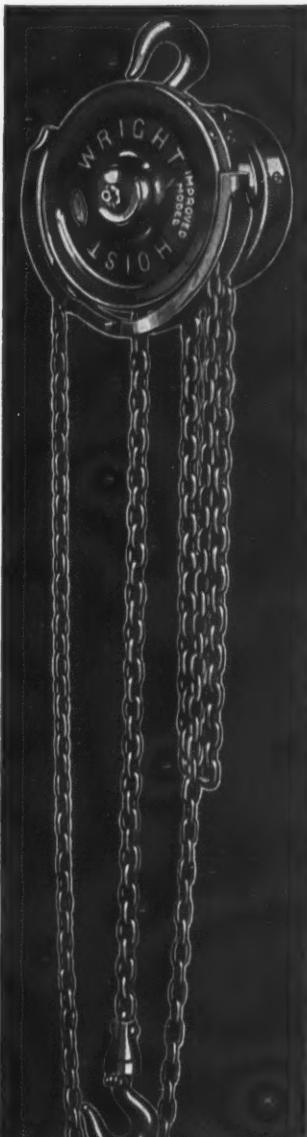
**WRIGHT MANUFACTURING DIVISION  
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*Improved* **High Speed Hoists**



polarized light work. From the standpoint of the amount of initial illumination transmitted to the object, the efficiency of this illuminator is several times that secured with the conventional clear-glass or prism type illuminator. Different degrees of polarization of the light beam are secured by the rotation of a quarter wave plate conveniently placed adjacent to the Nicol prism used in the vertical illuminator.

The dark field illuminator is a glass cube with central stop mounted in a rotating turret with the vertical illuminator prism. This permits rapid change from bright field or polarized light to dark field without disturbing the focus of the objective. Two dark field condensers are supplied for use with the different power objectives. These mount directly beneath the stage of the microscope.

A complete battery of six objectives and ten eyepieces is offered to give a full range of standard magnifications required for metallographic work. The objective holder is a quick-change type, centerable with clamp for positive positioning of the objective.

An entirely new photomicrographic lamp has been developed by Bausch & Lomb to give an intensity approximately

two and a half times that of any existing concentrated homogeneous light source. It is operated in conjunction with a transformer from the supply line. This lamp is supplied in a housing readily interchangeable with housing of the arc lamp.

The supporting stand is provided with a top beneath which is located the shock-absorbing devices for carrying the equipment. The outfit can be supported on the shock absorbers or lifted off by adjusting levers located under the top portion of the supporting legs. Adjustable damping devices regulate the tension on the spring support. In the supporting legs is the housing, the resistance, adjustable ammeter for the arc lamp and the transformer for the Mazda lamp. A two-drawer cabinet in the right end of the table accommodates accessories and plate holders.

#### Greenerd Hydraulic Ball Bearing Assembly Press

A 15-ton vertical press designed primarily for assembling ball bearings when used in conjunction with the necessary fixtures has been brought out by Greenerd Arbor Presses, Nashua, N. H. The press, which is to be known as the

# TIME EXPENSIVE LABOR!

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COMPUTES & PRINTS "ELAPSED TIME"

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## LOOK FOR THE LEADERS IN GROUPS OF THREE

Throughout fiction, history and in the stern realities of industry, you'll find that leaders come in groups of three.

To-day, three famous brands of files—Nicholson, Black Diamond and McCaffrey—are winning success with their ability to cut away metal, their almost phenomenal capacity to last far longer than ordinary files.

Back of Nicholson, Black Diamond and McCaffrey Files are this company's unlimited resources for producing quality files; our experts' tireless capacity for rigid testing; for perfecting new processes for improving files.

Try these Brands in your plant. Put them to work—making money for you.

At mill supply dealers. Nicholson File Company, Providence, R. I., U. S. A.



## FILE FOR EVERY PURPOSE

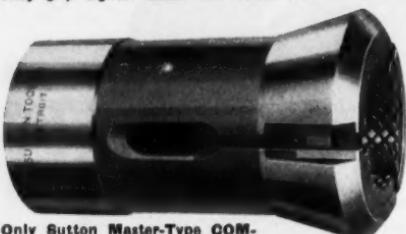
# ONLY SUTTON PRODUCTS OFFER THESE FEATURES

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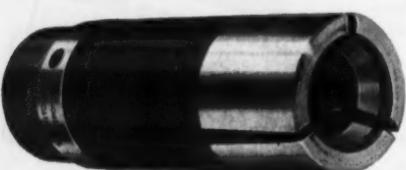
**GRIP**  
**COLLETS**



Only Sutton **DIAMOND-GRIP** Collets are diamond-serrated. They grip tighter under less tension.



Only Sutton **Master-Type COMPENSATING** Collets are designed for use on hot-rolled stock, with diamond-serrated pads that adjust themselves to a perfect bearing.

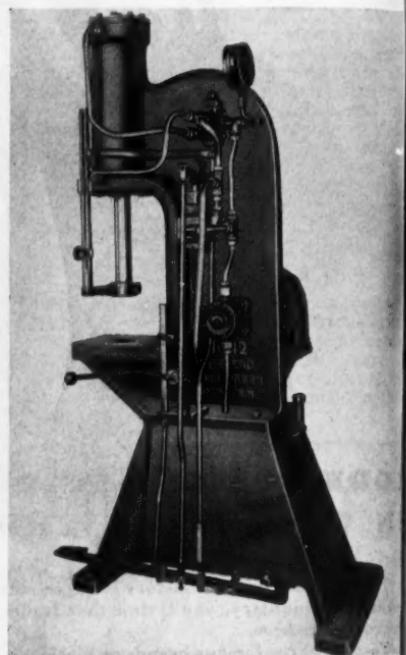


Only Sutton Style "L" Master Feed Fingers have pads positively held without pins or screws. Special pad design permits restoring hole size repeatedly.

WRITE FOR COMPLETE CATALOG  
**SUTTON TOOL COMPANY**  
2838 W. Grand Blvd., Detroit, Mich.

No. 60 BB, is also adaptable for straightening work when equipped with a special straightening table. The press is operated by a foot pedal, the amount of pressure exerted by the ram being controlled by the amount of pressure applied to the foot pedal. Pressure may be held evenly by means of the foot pedal or locked by a hand lever.

When the pressure is locked, it will



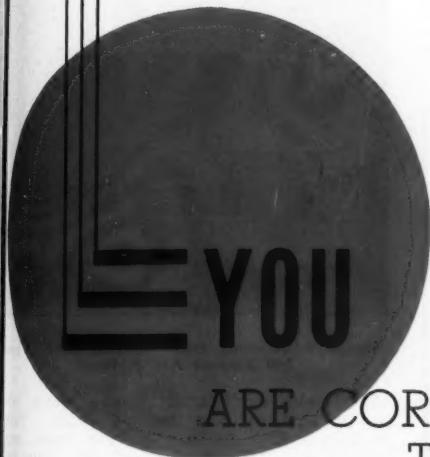
**Greenerd Hydraulic Ball Bearing Assembly Press**

remain indefinitely and evenly until the hand lever is tripped, which will automatically return the ram to the power stop. The stop may be set at any predetermined point, or, if preferred, the pressure may be held evenly by the foot treadle which, when released, will return the ram automatically to the back stop. When the ram is at the top position, the pump bypasses, relieving all pressure. Any desired pressure from 1/2 to 15 tons may be obtained.

The press is a self-contained unit with the tank in the base and a 3 hp motor mounted on the side of the frame. The frame and cylinder are constructed of a special semi-steel casting.

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**CLEVELAND - OHIO**  
**OCTOBER - 19 to 23**

**MODERN MACHINE SHOP**  
**PRODUCTS FINISHING**

PUBLISHED BY GARDNER PUBLICATIONS, INC.

The piston is of steel with six cast iron piston rings. The ram gland is packed with chevron type packings with a bleeder pipe to take care of any seepage plus an extra wiper packing which eliminates seepage of oil on the ram.

The press will handle work up to 18-in. diameter. The working table is 12x12 in. with a 3½-in. cored hole in the center. Height over table with ram up, 16 in. One-half ton to 15 tons pressure is exerted on the down stroke. The stroke is adjustable from 0 to 16 in. on the up stroke. Diameter of the ram is 2-7/16 in. Speed of ram on down stroke, 36 in. per minute.

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One of many Standards

Up-to-date Design

Best Material and Workmanship

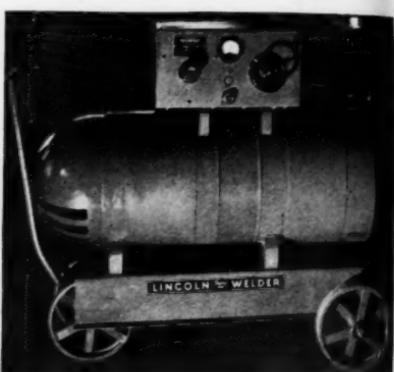
Manufactured by

**Zeh & Hahnemann Co.**  
184 Vanderpool St.

Newark, N. J.

## Lincoln "Shield Arc Sae" Dual Arc Control Welder

A line of single operator arc welders to be known as "Shield Arc SAE" is announced by The Lincoln Electric Company, Cleveland, Ohio. The new welders will supersede the present type

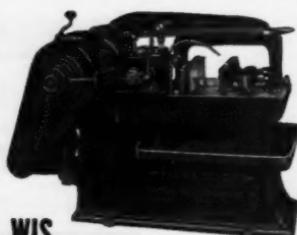


Lincoln Continuous Dual Control SAE Type 300 Ampere Arc Welder

of "Shield Arc" which have been on the market for the last six years. The predominating feature of the new arc welder is a new method of arc control which makes possible the adjustment of both arc heat and arc penetration in a continuous sequence of fine increments. It is claimed this continuous dual control assures absolute uniformity of performance at every control setting and adds greatly to the successful operation of arc welding.

It is a well known fact that for certain types of arc welding a low voltage with wide range of current control is desired, and for other types of work a higher voltage with the same wide range

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METAL CUTTING MACHINES  
"Standard the World over"  
RACINE TOOL AND MACHINE CO • RACINE, WIS.



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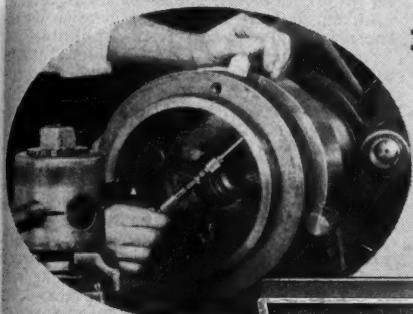
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Checking  
bore of die  
with **LUFKIN**  
inside micrometer

Send for  
Catalog No. 7



MICROMETER SET NO. 600-A



MICROMETER HEAD AND EXTENSIONS

**Why *LUFKIN* Inside Micrometers Are So Popular**

THE MICROMETER HEAD is designed to measure from  $1\frac{1}{2}$  inches up. It is the only Inside Micrometer that can be built up at both ends, keeping the head in the center. With this important and valuable feature, measurements are easy to take because you can get a most sensitive feel, adjust the length most accurately and the reading point is directly in the line of vision.

Tubular steel rods, while light weight, give the tool, even when built out to extreme ends, the stiffness so necessary for close measurements. Each rod is adjustable for length by means of the hardened plug at one end.

Handle is furnished which can be attached anywhere along the length of the Tool, handy for reaching down into slots and small openings, and preserving that perfect balance so essential to accuracy.

LUFKIN Inside Micrometers are made in various combinations ranging from  $1\frac{1}{2}$  to 40 inches.

**Specify *LUFKIN* Tools for Your Shop Equipment**

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106-110 Lafayette St.

**THE LUFKIN RULE CO.**  
SAGINAW, MICHIGAN, U. S. A.

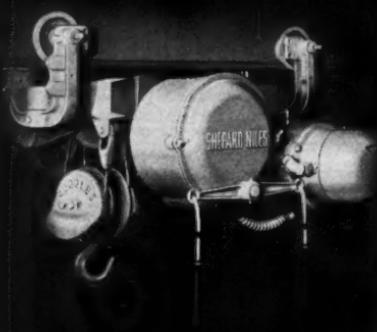
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MOST COMPREHENSIVE LINE  
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of current is best. The new welder permits the use of the correct voltage and current for all classes of work in the range of each size of machine.

In all types of welding machines heretofore it has been impossible to obtain these continuous adjustments, a compromise setting being the result. It is claimed that the new machine, with its wide range of setting of both voltage and current, results in the most satisfactory welder performance possible.

The "Shield Arc SAE" welder retains all of the other design points of the popular "Shield Arc" models, such as independent excitation, laminated magnetic circuit, all purpose meter, polarity reversing switch, no voltage motor protection, etc. The base and portable parts have been redesigned for a more streamlined effect and shorter wheel base.

"Shield Arc SAE" welders are available in the following types and ratings:

A.C. Motor driven—200, 300, 400 and 600 Amperes; D.C. Motor driven—300, 400 and 600 Amperes; Generator for belt or couple service—200, 300, 400 and 600 Amperes, and Engine driven—200, 300 and 400 Amperes.

### Kar Duo Magnetic Chuck

The Kar Engineering Co., Inc., 200 Hudson St., New York, N. Y., has brought out a magnetic chuck which is said to possess a number of unique and valuable features. The Kar Duo Magnetic Chuck can be used to both hold and demagnetize hardened steel work, and can be operated from any commercial power service. It is said that this chuck will demagnetize any piece of hardened steel so that filings will no longer cling, and so in addition to being an effective magnetic chuck is also highly efficient as a demagnetizer.

The manufacturer states that the chuck is also capable of completely demagnetizing any work which it has held during a machine operation, which feature entirely eliminates the necessity for a separate demagnetizer. The chuck has a holding power in excess of 125 lbs. per square inch, which is more than ample for any machine operation. This great holding power, however, is obtained by advanced magnetic circuit design rather than by an increase in the current required. The coils used to supply the magnetic field are wound with enameled wire, which enables the use of a conductor large enough to carry the required current with practically no heating, even with continuous operation.

The chuck can be supplied to oper-



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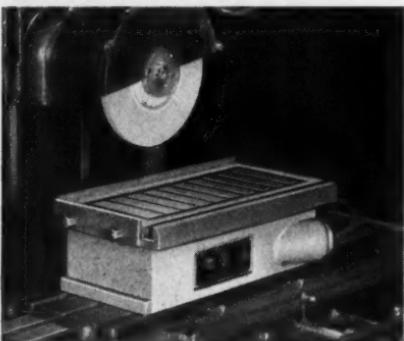
Union Cold Drawn Steels exactly meet that description and are instantly available to you at the warehouses of distributors in your vicinity.

Union Drawn Distributors deliver rush orders every hour of the day. They will fill your needs promptly and give up-to-the-minute information on steel economies.

**Union Cold Drawn Steels**



ate from either alternating or direct current circuits of any commercial voltage or frequency. The direct current required for operation of the chuck it-



**Kar Duo Magnetic Chuck**

self is obtained from a rectifier in the power unit. Thus no motor generator is required and each unit is independent of the other in a given installation. Efficiency is high since only the chucks in operation require power and no losses are supplied to motor generators.

The Kar Duo Magnetic Chuck has a completely laminated magnetic circuit to reduce eddy currents and hysteresis and allow passage of alternating magnetic flux for demagnetizing. The laminations are rolled steel of 99.68 per cent pure iron and those in the top plate are ground to an accurate fit with those in the body of the chuck, reducing the magnetic circuit reluctance. The laminations are riveted together to form an integral unit.

Each pole of the chuck has its individual coil, which is taped and impregnated to render it impervious to moisture. The body of the chuck is an accurately machined casting and the face plate has a T-slot for locating the work for heavy machining, with back and end stops. The face plate is adaptable to hold work of any size and the very small gap between the pole pieces enables the smallest work to be held securely.

The power supply unit includes a pressed steel cabinet for holding the necessary apparatus. Two switches, one for "on-and-off" and the other for changing chuck connection from "holding" to "demagnetizing" position are mounted on the front of the cabinet. The switches are of the heavy duty toggle type, with a current rating well in

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## SAVE YOUR DIEMAKERS' TIME!

Let them file your dies, gauges, etc., in half the ordinary time with a

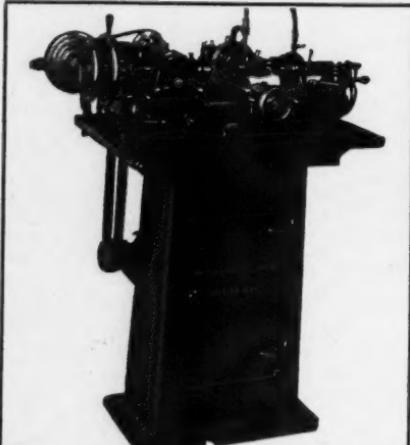
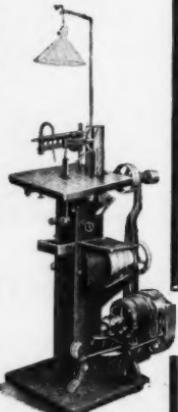
### REARWIN DIE FILER

(Patented)

This machine files, saws, trims templates, patterns, jigs, etc., better and in one-half to one-fifth the time required by hand method. Handles closed bottom and close top dies. Has wide range of adjustments. Takes any size file.

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### WALTHAM THREAD MILLER

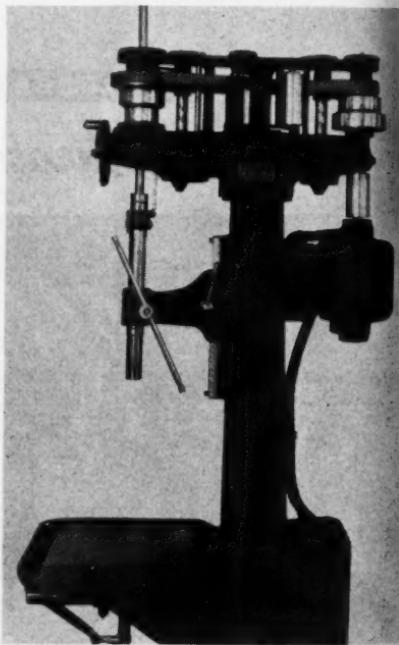
Let us explain why this machine is largely used for special taps, single and multiple worms, etc., in tool rooms and factories.

WALTHAM MACHINE WORKS  
WALTHAM, MASS.

excess of the actual load. This margin of safety insures satisfactory service. Special layouts, having switches mounted in special places, can be supplied on order.

### Motor Drive for Footburt Sipp Sensitive Drilling Machine

The Sipp Sensitive Drilling Machine built by The Foote-Burt Company, Cleveland, Ohio, is now being equipped



Footburt Sipp Sensitive Drilling Machine  
Equipped with Motor Drive

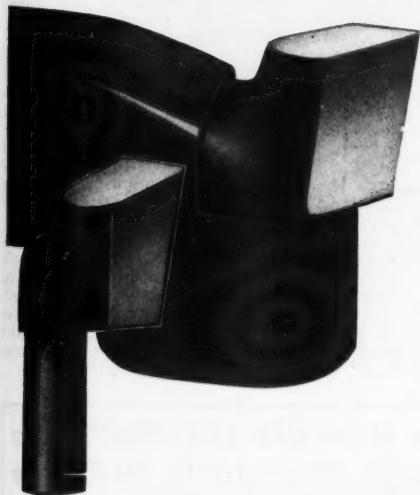
with a motor drive consisting of a standard foot mounted ball bearing motor which is mounted on a bracket at the rear of the column of the machine. The motor armature shaft is connected to the rear cone pulley drive shaft by means of a flexible coupling which makes a very short, compact drive and provides three spindle speeds of 1035, 1725 and 2915 r.p.m. Any one of these speeds can be obtained by merely shifting the speed lever at the front of the machine.

The motor runs at a constant speed at all times. The drive has been espec-

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## Each has its own enthusiastic following



### SHANK TYPE

This sturdy holder with round-shank bit, representing over 30 years' development, is still in regular demand where the work does not require the flexible bit adjustment of the present-day O. K. design. Hence, these original tools are always in stock. In this type, the bit drops naturally into true cutting position, where a turn of the wrench secures it as solidly as though bit and holder were integral!



### SHANKLESS TYPE

Here the bit has a serrated under-face, which meshes with serrations in the seat of the holder. By loosening the locking clamp, bit may be moved side-wise, to compensate wear.

All O. K. Tool Holders are of alloy steel. The bits are of high speed steel, and are available for all metal cutting jobs. Further details on request.

THE



# SYSTEM

OF INSERTED-BLADE METAL CUTTING TOOLS

THE O. K. TOOL CO., SHELTON, CONN., U. S. A.

ially developed for the Footburt Sipp medium size or BK style Sensitive Drilling Machine which has a capacity of  $\frac{5}{8}$  in. in cast iron.

### Brown & Sharpe No. 10 Plain Milling Machine

Full electrical control of all table and spindle power movements features the No. 10 Plain Milling Machine announced by Brown & Sharpe Mfg. Co., Providence, R. I., as the latest addition to their line of production millers.

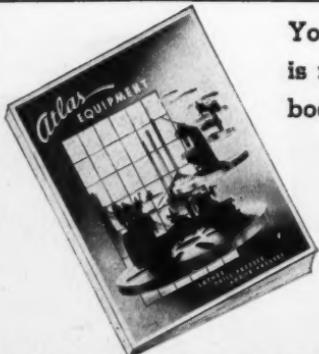
Combining many of the proven design features of the successful Light Type and No. 12 Plain machines, the No. 10 Plain is a sturdily-constructed knee-type production unit designed specifically for the rapid manufacture of small parts on either long or short runs. A wide range of spindle speeds (16 rates, from 55 to 1800 r.p.m.) makes possible the efficient machining of materials ranging from tough alloy steels to free-cutting brass and aluminum; and the rugged one-piece column and rigidly-braced knee, together with the "set-back" column face which permits placing the cutters closer to the spindle nose, enables the No. 10 to take heavy cuts without chatter.

This machine has a 12-in. table feed, 2-in. transverse adjustment of spindle, and 11½-in. vertical knee adjustment. Hand adjustments in all three directions, together with all of the other principal adjustments and operating controls, are within easy reach from the front of the machine.

The No. 10 Plain offers a wide variety of automatic milling cycles, and, due to the control system employed, a very rapid and sensitive tripping action is assured, so that in stopping the table, reversing, and in all other changes in table movement, there is exceptional accuracy of control and dependability of performance. The spindle, table, and coolant pump are each driven by separate, direct-connected constant speed motors. The spindle motor has an integral, electrically-controlled mechanical brake which holds the spindle stationary, to prevent marking the work with rotating cutters and to facilitate cutter replacement.

Automatic power movements are governed by adjustable table dogs through a control unit mounted on the front of the knee. Manual control is by push button in the same unit, which also includes a "Stop" button for instant stopping of the table, and a "Spindle Jog" button to facilitate set-up.

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Ten minutes with this big new 52 page catalog will save you many dollars in equipment costs this Fall. It's our 25th Anniversary. We're offering the greatest values in our history. Send today for your copy—it's FREE. See all the latest improvements in lathes and drill presses. See the extra features Atlas provides at no extra cost.

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- Heavy gage stampings come from presses and machine shop, coated with stamping lubricant, cutting and buffing compounds.

Before going to spray booths, the work is fed through this Detrex\* Degreasing Machine. As the conveyor carries the trays of the parts through, they are subjected to Perm-A-Clor vapors and come out perfectly clean and dry.

Absence of fire hazard (Perm-A-Clor is non-inflammable)—complete degreasing—reduced cleaning costs—better finish and elimination of rejects are some of the important reasons so many companies have adopted Detrex Degreasing.

One of the complete line of Detrex Machines will meet your degreasing needs. Ask for information.

\*Reg. U. S. Pat. Off.

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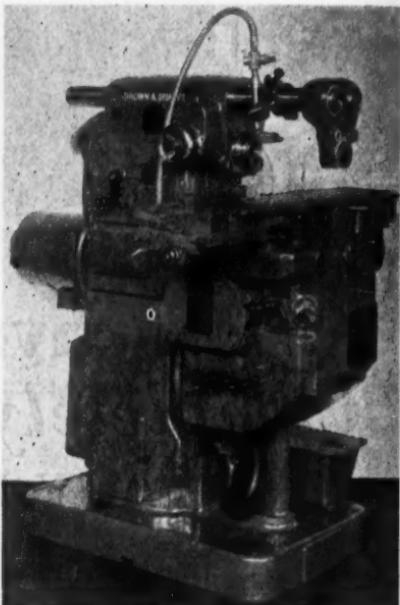
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**UNIVERSAL ENGINEERING CO.  
FRANKENMUTH, MICH.**



A control switch permits the spindle to stop and start with the table, to rotate only during cutting feed, or to run continuously, independent of table movement, as desired. Another switch sets the spindle to rotate in either direction, or to be inoperative. These control switches, together with a safety switch for instantly stopping both table and spindle, are conveniently located on the knee.

The entire table driving mechanism.



**B & S No. 10 Plain Milling Machine**

including the constant-speed motor, is compactly built into the knee, with anti-friction bearings used throughout. In addition to the 16 feed rates ( $\frac{1}{2}$  in. to  $20\frac{1}{2}$  in. per minute), the motor provides a fast-travel table movement of 300 in. per minute in either direction whenever desired.

Spindle drive is from a direct-connected, flange type motor mounted on the rear of the column. The 16 speeds available (55 to 1800 r.p.m.) are obtained in two series through simplified change gearing and a series selective lever. The spindle drive is of unusual efficiency, for anti-friction bearings are used throughout, the drive is positive, and there are never more than three

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No. 81

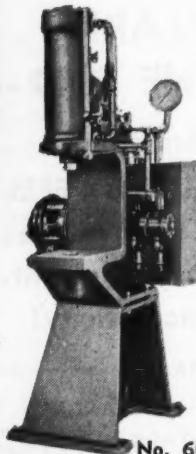
# Greenerd ARBOR PRESSES CUT PRESS-WORK COSTS!

## NEW No. 81 HYDRAULIC PRESS

A highly efficient press on an unusually wide range of applications — particularly adaptable to light plastic molding. Quick, easy adjustments give desired pressures up to 15 tons on different kinds of work. Advanced features of design insure higher production, safer operation and greater economy.

## No. 60 HYDRAULIC PRESS

A fast, efficient press for assembly work, push or pull dry broaching, keyway cutting and light plastic molding. Pressures up to 15 tons.



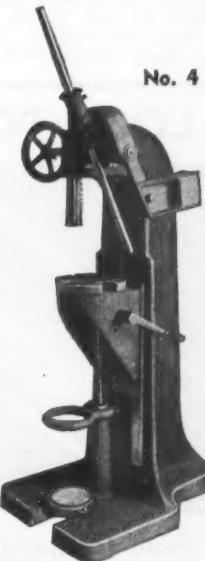
No. 60

## No. 4 HAND PRESS

Features an adjustable knee tongued into the planed surface on the frame. Receives diameters up to 18". One man can obtain 7 tons pressure.

The GREENERD line includes 65 styles of hand operated presses delivering from 500 lbs. to 35 tons pressure . . . Motor Driven, 3 tons pressure . . . Hydraulic Arbor Presses, C Clamp and four posted type up to 15 tons pressure.

*Write for literature giving complete information on GREENERD presses.*



No. 4

# GREENERD ARBOR PRESSES

NASHUA

Est. 1883

NEW HAMPSHIRE

points of gear contact between motor and spindle. Electrical and mechanical safeguards provide the utmost in safety, both to the operator and to the machine.

Every important bearing surface of the No. 10 Plain is lubricated automatically by means of pumps built integral with the spindle and table driving mechanisms.

The machine is equipped with a built-in coolant system, with ample provision for the quick disposal of both coolant and chips, which flow via wide troughs and a large down-pipe to the removable chip box on the base. The coolant returns to the tank in the base.

Equipment which can be furnished as extra, includes a treadle attachment for starting the table in fast travel in either direction, allowing the operator free use of both hands; automatic spindle reverse for double-fixture milling; and a hinged arm brace to assure the most rigid support of the arbor yoke.

### Geist Roller Pipe Cutter

The No. 4 Geist Roller Pipe Cutter shown in the illustration is now being marketed by the Landis Machine Company, Inc., Waynesboro, Pa.

The shaft, which carries a disc cut-



Geist Roller Pipe Cutter

ter, is mounted in Timken Roller Bearings instead of bronze bushed bearings heretofore used. According to the manu-

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**It identifies  
CUMBERLAND STEEL  
SHAFTS — Guarantees  
their Accuracy, Straight-  
ness and Concentricity!**

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SPECIAL (Any Diameter)	STANDARD
<b>LIMITS <math>\pm 0.0005''</math></b>	Small Dia. { $+0.000''$ $-0.002''$
or any other total tolerance of $0.001''$	Large Dia. { $+0.000''$ $-0.003''$

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# To Readers of MODERN MACHINE SHOP

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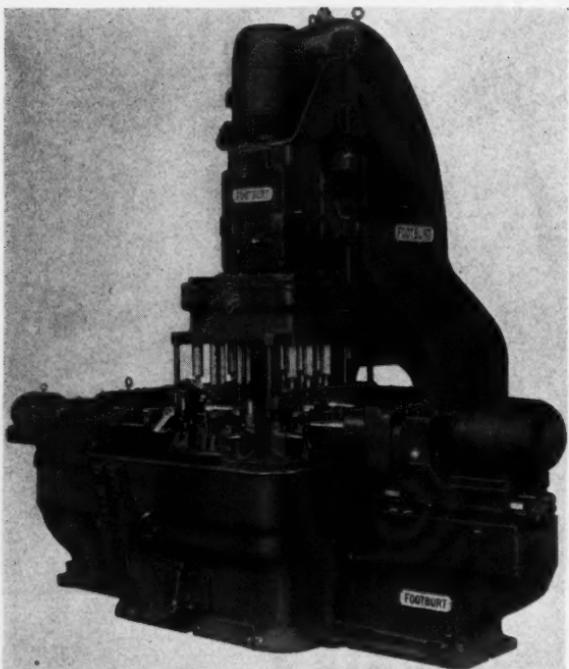
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City ..... State .....

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Also send copy to ..... Title .....



Footburt 4-Way 25-Spindle Drilling and Tapping Machine

facturer, this makes a stronger construction, insures longer life and eliminates the need for making frequent adjustments to compensate for wear.

The added rigidity of this mounting as well as the precise alignment obtained by the cutter shaft and the rollers is said to minimize cutting-off time, reduce the burr thrown on the pipe, and increase the life of the disc cutter. The No. 4 Geist Roller Pipe Cutter has a total capacity for cutting off pipe

within a range of  $\frac{1}{4}$  in. to 4 in. inclusive.

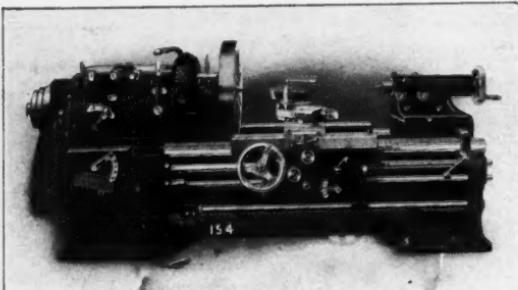
### Footburt 4-Way 25 Spindle Drilling and Tapping Machine

The illustration shows a 4-way 25-spindle combination drilling and tapping machine which has been developed by The Foote-Burt Company, 1300 St. Clair Ave., Cleveland, Ohio, for use in drilling, chamfering and tapping an automotive part.

The machine is equipped with four heads, each independent of the others. The upper, left hand, and rear heads are mounted on hydraulic feed drilling units, the upper unit being one of the largest of the Footburt units. The ways of the upper unit are 16 in. wide, while the left hand and rear units have ways 10 in. wide. The right hand head is mounted on a lead screw tapping unit which has ways 1

in. wide. All units are electrically controlled and are started by means of a push button. Each unit goes through its individual cycle and returns to the starting point where it remains until the push button is again operated.

The fixtures in which the parts are held are mounted on a four-position circular indexing table, each fixture holding three parts. The upper head performs three operations in consecutive order on each part. The first station



### CINCINNATI LATHES

Sizes from 14" to 32" belt or motor drive, complete with bronze or anti-friction bearings.

#### SPECIALISTS OVER 30 YEARS

Where precision is essential and production important, users everywhere have found the Cincinnati most economical to install.

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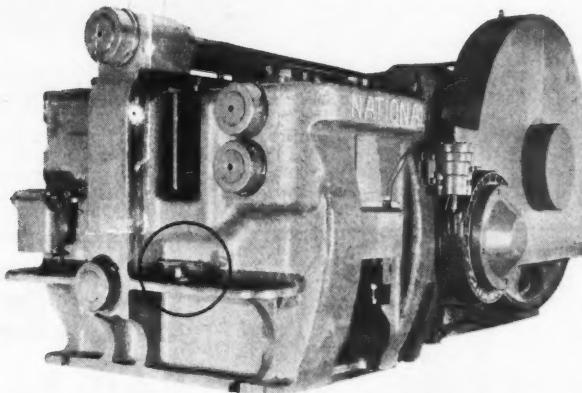
Oakley, Cincinnati, Ohio, U.S.A.

# ROSS

## Operating Valves

"The Bridle for  
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### Machines with "Finger Tip Control"



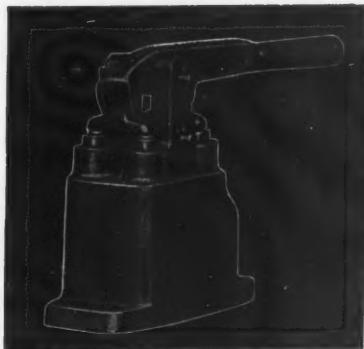
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this 265,000-lb. giant  
actuated through Ross  
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The poppet principle employed in Ross design accounts for the unusual speed of operation and delicacy of control.

Write for new catalog describing the entire line of Ross Operating Valves.

**Ross Operating Valve Co.**  
6488 Epworth Blvd. Detroit, Mich.



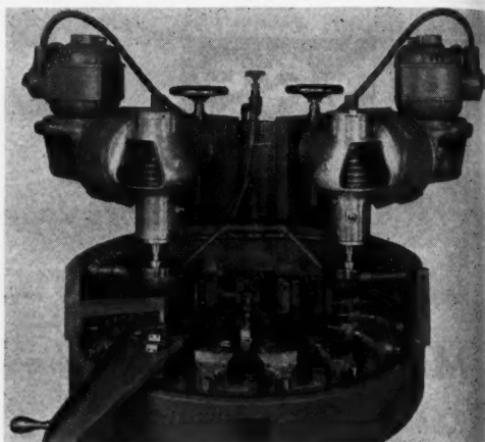
of course, the loading station. The parts are drilled at the second station, bored at the third station and line reamed at the fourth station. In each cycle of the machine the four heads perform six operations on each part.

All controls are located at the front of the machine, and the machine is of the usual sturdy Footburst construction.

### Bergram Type DG-1 Automatic Surface Grinding Machine

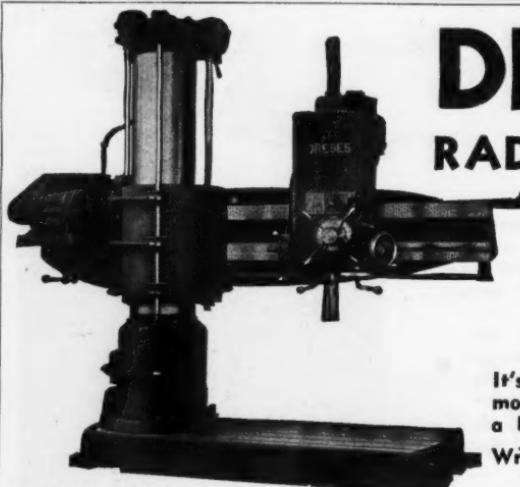
The Bergram Mechanical Engineering Co., New Britain, Conn., has brought out an automatic surface grinding machine for the grinding of small parts in large quantities. As shown in the illustration, the machine can be equipped with automatic chucks mounted on a rotating table. The chucks are built to accommodate parts of any shape to be either milled or

The only manual operation involved is that of loading the work into the



Bergram Type DG-1 Automatic Surface Grinding Machine. The guard which normally covers the wheels has been removed to show the interior of the machine.

chucks. The table rotates continuously and as the chucks reach the vicinity of the roughing wheel they automatically close. After the parts have been passed



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**Tougher. Stronger**

The performance of Disston Di-Mol Hack Saw Blades is amazing shop men who previously have been using carbon or molybdenum blades.

Di-Mol Blades do not have to be codded in the hands of workers on special steels, modern alloys, high-test iron castings and the like. In power production on hard, tough materials, Di-Mol withstands the strains of the most trying combinations of feed and speed developed in modern machine sawing!

Di-Mol means New Value, New Economy. DI-MOL, on orange band,

DISSTON U.S.A.  
 Di-Mol

identifies the blade. Made standard lengths, widths, thicknesses and teeth. Packed, hand blades  $\frac{1}{2}$ -gross in box; machine blades, 1 dozen in box. Let us give you Di-Mol demonstration on your own work. Henry Disston & Sons, Inc., 1021 Tacony, Philadelphia, U. S. A. Branches: Boston, Chicago, Detroit, Memphis, New Orleans, Seattle, Portland, Ore., San Francisco, Vancouver, B. C. Canadian Factory: Toronto.

**DISSTON DI-MOL**  
 HACK SAW BLADES

under the finishing wheel, the chucks automatically open and the parts are ejected. Thus it is unnecessary to stop the table or the grinding wheels at any time and no wrench is required for clamping or unclamping the work in the chucks.

The operating units consist of two Dalrae Speedmills, which are so mounted that they can be adjusted vertically as required. These Speedmills are used because of their heavy spindle construction and the fact that a heavy flywheel on each spindle lends itself effectively to the task. The design of the Dalrae Speedmill is such that very little power is required for efficient operation.

Two diamonds mounted on the table of the machine keep both the finishing wheel and the roughing wheel dressed so as to produce best results and finish work to the size designated. The machine shown is built for wet grinding and is furnished with motors up to 2 h.p. On the job indicated, the production was 1000 finished pieces per hour.

### Redesigned Model of National Oil Extractor

The illustration shows the National Oil Extractor which is now being marketed by the National Separator Co.—a subsidiary of The Leon J. Barrett Co., Worcester, Mass. While the extractor itself is not new, it has recently been redesigned to present the modernized appearance shown in the illustration and has several features which have not been available heretofore.

The machine is available in either the spindle post type or the free center type. In the former type, the machine is furnished with pans having a center sleeve post telescoping the spindle which also passes through a center hole in the cover. The end of the spindle is threaded and fitted with a nut for holding the

pan cover against the top of the pan. Knobs on the pan post provide for lifting the pan in and out of the machine. Lifting handles are furnished if specified.

The design of the free center machine is entirely new. In this design the pans have no center post, a rim-locking device being provided for holding the pan cover down. Long curly chips, difficult to load in a pan having a center post, are handled easier by this method. Pans are provided with lifting eyes at the side, and the large sizes are reinforced.



National Oil Extractor Redesigned to Incorporate New Features

Standard extractor pans are of light gauge metal, fully enclosed and protected when running. In the majority of cases the chips are not heavy and they become lighter after the oil has been extracted, thus the light weight pan may be lifted in and out of the machine by hand. The conical shape with flanged top provides adequate strength in a light weight pan.

The base, column, curb and drum have been improved for rigid assembly and are now cast of semi-steel with heavy cross section. The large machine spindle which carries the loaded chip bowl is fitted to run vertically in a long bearing. The spindle gear box is of heavy construction with a ball base and is designed to pivot and oscillate on a socket in the machine base. Radial springs acting to cushion vibrations and to compensate for gyrating at critical speeds due to uneven loading of the chip pan maintains the spindle gear box in vertical position. Spiral gears are of

### "American" Amplifying Gauges



A rugged production tool for the rapid inspection of parts to close tolerances. Widely used in the automotive and other high production fields.

Write for bulletin with new low prices on standard and special adaptations to suit your work.

The American Gauge Co.  
Dayton, Ohio

# For High Speed Snagging



Sterling Resinoid bonded High Speed Snagging wheels have earned an enviable reputation in the field for their ability to produce quantity with quality. They are fast cutting, long lived and hold their shape. Specify STERLING --

*The Wheels You Can Depend Upon*

**THE STERLING GRINDING WHEEL COMPANY**

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**STERLING**  **ABRASIVES**

nickel steel, heat treated and accurately ground and run in oil in the spindle gear box unit. Power is transmitted through a self-adjusting drive shaft. After research involving all the safety laws of the various states, every safety feature of which the designer is aware has been made applicable to this machine.

### Remco 20-Ton Hydraulic Press

A wide variety of pressing and straightening jobs can be handled in the 20-ton hydraulic press which has been placed

### Anderson Improved Balancing Ways

#### No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in  
the following sizes:

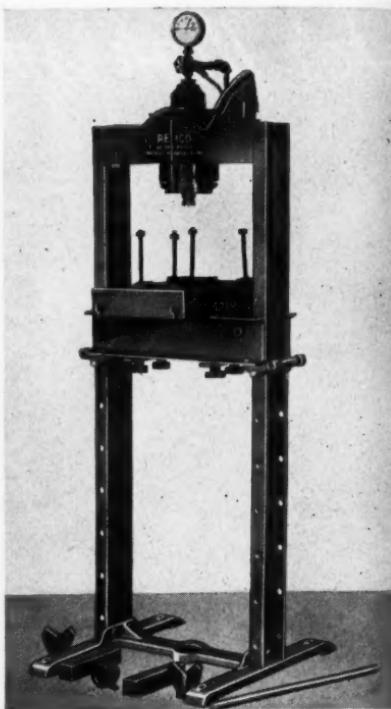
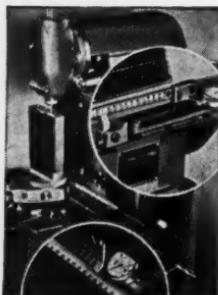
Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four chilled iron discs rotate on sensitive special bearings



*Write for Full Information*

Mfd. **Anderson Bros. Mfg. Co.**  
By  
1926 Kishwaukee St., Rockford, Ill.



Remco 20-Ton Hydraulic Press

on the market by Manley Products Corporation, State and Hay Sts., York, Pa. The press is entirely self-contained; thus it can be located in the most convenient position and moved about at will. Power is applied by hand operation, the ram traveling  $\frac{1}{8}$  in. at each stroke of the lever.

The press is built with a solid malleable head, the top frame, cylinder, and

### DECKEL SUPER UNIVERSALITY MILLING MACHINE FP1

Vertical, Horizontal, Angular Milling—Boring—Counter Boring—Facing—Drilling—Slotting—High Speed Profiling—Routing. All in one set-up.

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- SET No. 16, consisting of 5 Blocks, will make 31 gages in steps of .0625 inch from minimum size .0625 inch to maximum size 1.9375 inches. In "B" quality, with accuracy of  $\pm .000008$  inch, this set sells for only \$26.50.
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- CATALOG No. 11 lists all the Sets, individual Gage Blocks and Accessories. It is yours for the asking — the coupon is for your convenience.

*Manufactured and serviced in the United States by*

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*Johansson Division, Dearborn, Michigan*

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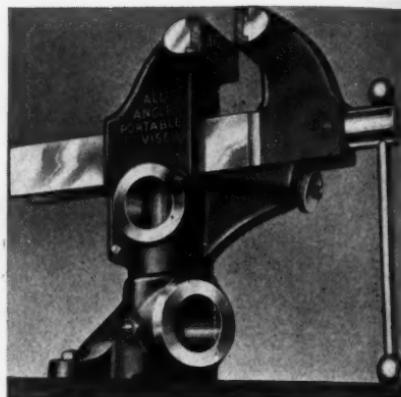
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oil box being cast as a single unit. The table is supported by two heat treated cromium nickel steel pins which rest in four inverted V bearings. The inside clearance of the table is  $20\frac{1}{4}$  in., the table travel is 35 in., and the ram travel is  $4\frac{1}{2}$  in. The width between table channels is  $5\frac{1}{8}$  in. Overall height is 5 ft. 11 in. and the floor space required is  $26 \times 26\frac{1}{2}$  inches.

The auxiliary table is movable in two directions: thus any part of the work clamped to it may be supported under the ram. T slots are provided in the base of the auxiliary table which are used in clamping the auxiliary table to the base. The auxiliary table is  $12 \times 19\frac{1}{2}$  in. The weight of the press is 300 lbs.

#### "All-Angle" Portable Vise

Many convenient features are included in the design of an ingenious bench vise that has been placed on the market by the Police & Sportsmen Supply Co., 349 S. Vermont Ave., Los Angeles, California. The construction of the vise permits practically instantaneous locking of the work at any angle in any of four different planes. This is made possible by the use of a tubular post as the main support and upon which the vise revolves.



"All-Angle" Portable Vise

The post can be used in either vertical or horizontal position and the vise can be used in the usual vertical position or sidewise in either position of the post. Closing the jaws on the work automatically locks the tool in the desired position, or it can be locked by tightening the thumb screw at the front of the vise.

## IT'S PRECISION BUILT the C-O 21" Sliding Head Drill

Here's a typically accurate, flexible, yet larger C-O Drilling Unit for high production drilling of large holes. Self-feed and back gear attachments provide a wide range of speeds and feeds.

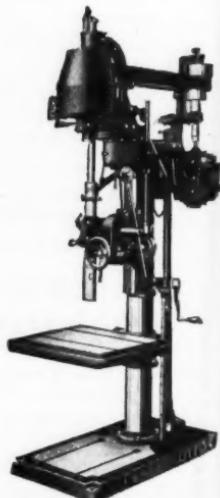
Vertical Motor Drive—eliminates unnecessary pulleys, idlers, twist and turn belts, reducing wear and vibration; cone pulleys are dynamically balanced, a flexible coupling inserted removes vibration in the drive shaft. Two Timken Roller Bearings in the Spindle Quill at the top and bottom, provided with a screw adjusting collar for take up. Annular ball bearing in the motor cone pulley, and ball bearing motors. Positive type power feed is controlled by a push knob.

Canedy-Otto Drills are always "Ready For The Job".

Write for illustrated circular giving complete details.

**CANEDY-OTTO MFG. CO.**  
CHICAGO HEIGHTS

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# A MAJOR PRICE REVISION OF VASCOLOY-RAMET TOOLS and BLANKS

EFFECTIVE OCTOBER 1, 1936

The new price schedule for Vascoloy-Ramet Tools, effective October 1st, 1936, provides the metal cutting world the best tool material at the most economical prices.

**SIMPLICITY**—The new simplified price schedule is based on 45 cents per gram for plain rectangular blanks.

**ECONOMY**—The schedule provides reduction as great as 50% in the cost of carbide tips, in some sizes; and averages 30% reduction in the cost of blanks of the sizes in most common use. Corresponding reductions are effective in the cost of tools manufactured from these blanks.

A few examples of the old and new prices are given in the following table:

SIMPLE RECTANGULAR BLANKS			FINISHED TOOLS, in Lots of 5 to 9			
Size	Old Price	New Price	Shank Size	Tip Size	Old Price	New Price
$\frac{3}{16} \times \frac{3}{4} \times \frac{35}{32}$	\$ 3.38	\$ 1.80	$\frac{3}{16} \times \frac{3}{8} \times \frac{23}{32}$	$\frac{3}{32} \times \frac{3}{16} \times \frac{3}{16}$	\$ 5.22	\$ 4.15
$\frac{3}{16} \times \frac{3}{8} \times \frac{5}{8}$	7.78	4.95	$\frac{3}{4} \times \frac{3}{4} \times \frac{8}{32}$	$\frac{3}{16} \times \frac{3}{16} \times \frac{5}{16}$	11.06	8.05
$\frac{3}{16} \times \frac{3}{8} \times \frac{15}{32}$	9.92	6.75	$1 \frac{1}{16} \times \frac{7}{16} \times \frac{7}{32}$	$\frac{3}{4} \times \frac{3}{8} \times \frac{3}{16}$	16.44	12.75
$\frac{3}{4} \times \frac{3}{4} \times 1 \frac{1}{16}$	16.61	13.50	$1 \frac{1}{4} \times 1 \frac{1}{4} \times 7 \frac{7}{32}$	$\frac{3}{8} \times \frac{3}{16} \times 1$	25.67	22.25

*Write for our new price list*

VANADIUM-ALLOYS STEEL CO., VASCOLOY-RAMET DIVISION, NORTH CHICAGO, ILL.

# VASCOLOY-RAMET

... The TANTALUM CARBIDE TOOL MATERIAL ...



A GRADE FOR EVERY USE

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You can be glad when there's no work for the maintenance man . . . when production's running smoothly. The less fixin' up he has to do, the better off you are. Breakdowns mean costly delays—time losses for men and machines—extra expense.

P&H cranes will ask mighty little of your maintenance department. They're designed with the liberal safety factors to meet the toughest requirements; to deliver service without interruption for years to come. This well-known reliability is the result of long experience with all sorts of material handling problems . . . of 50 years' leadership as America's largest builders of overhead handling equipment. This is the practical experience that saves you money whatever your particular handling problem may be.

Write for Bulletin 131.



Electric welding of end trucks, gears, etc., gives P&H cranes still greater strength and reliability.

**HARNISCHFEGER CORPORATION**  
ESTABLISHED 1884

4535 W. National Ave. Milwaukee, Wis.

**PH ELECTRIC CRANES**  
**ELECTRIC HOISTS**

The vise is made from alloy steel castings, accurately machined to produce a precision tool. It is available in two sizes either for wood working or metal working. As a machinist's vise, it is supplied with removable hardened steel jaws  $2\frac{1}{2}$  in. or  $3\frac{1}{2}$  in. wide. Interchangeable jaws permit the use of the vise for all types of work.

### Oilgear Type XM-80 Cyclematic Broaching Machine

Two dynamo yokes of hot rolled flat steel strip welded together are finish broached per cycle at the rate of 300

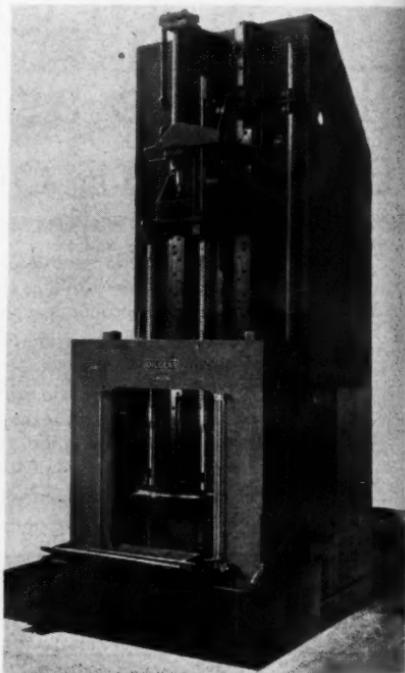


Fig. 1—Oilgear Type XM-80 Cyclematic Broaching Machine

parts per hour on the Oilgear Type XM-80 Cyclematic Broaching Machine shown in the illustration. This machine, the largest machine of its kind, was designed and manufactured by The Oilgear Company, 1400 W. Bruce St., Milwaukee, Wisconsin.

The machine, shown set into its pit in Fig. 1, is 187 in. high and 68 in. wide.



## OTHER WILLIAMS' PROFIT PRODUCERS



### "VULCAN" DOGS

Bent and Straight Tail Patterns with Single or Double Screws—both Safety and Set Screw Types. All sizes.



### "C" CLAMPS

Drop-forged; heat-treated. Five patterns in all popular sizes for light, general and heavy service; 40 different Clamps,  $\frac{1}{4}$  to 18" gap.

### "VULCAN" STRAP CLAMPS

Drop-forged; heat-treated. 6 patterns.

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Williams' "Agrippa" Tool Holders insure fast, chatter proof, clean cutting performance *at the turning point*. They enable you to "get out" of a lathe everything the designer built into it.

Cutter seats are accurately broached and carefully hardened. The commonest cause of cutter breakage—marred or recessed cutter seats—is eliminated by "Agrippa" design and construction.

There is an "Agrippa" Tool Holder for every regular operation of lathe, planer and shaper. Ask your distributor, or write for literature.

**WILLIAMS**  
SUPERIOR DROP-FORGED TOOLS  
**"AGRIPPA"**  
**TOOL HOLDERS**  
"THE HOLDERS THAT HOLD"

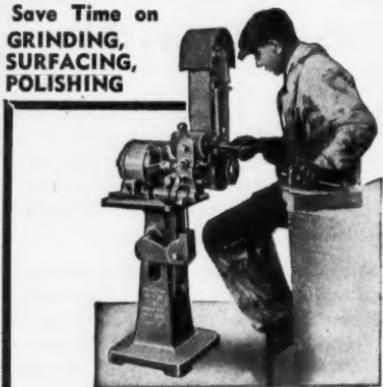
**J. H. WILLIAMS & CO., 75 Spring Street, NEW YORK**

Headquarters for: Drop-Forged Wrenches, (Carbon and Alloy) Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tong and Vises, etc.

WESTERN WAREHOUSE & SALES OFFICE, CHICAGO — WORKS, BUFFALO, N. Y.

The front-to-back dimension is 92 in. Normal broaching capacity is 80,000 lbs. with a peak broaching capacity of 120,000 lbs. Maximum stroke is 54 in. and the cutting speed is variable from 5 to 30 in. per minute. Weight, 30,000 lbs. The machine is equipped with an Oil-gear Type DR-6011 Variable Delivery Pump and Oilgear Type C-2011 Constant Displacement Pump, both of which are driven through a texrope drive from a 75 h.p. electric motor. The pump, motor, piping, valves and control mechanism are all mounted inside the frame. The frame is of all steel welded construction.

Save Time on  
GRINDING,  
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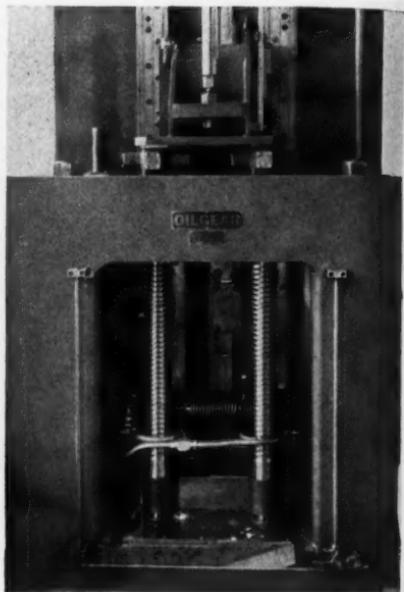
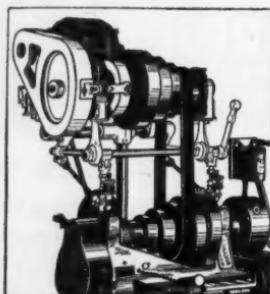


Fig. 2—View of Oilgear Cyclematic Broaching Machine, Showing Tools Entering Work

A close view of the machine showing the tools entering the work and ready for actual broaching operation is shown in Fig. 2. The tool handling crosshead is illustrated in lowered position, the tools threaded into the work and the carriage ready to raise the work over the tools. At the upper end of the carriage stroke the work is mechanically ejected onto a false table. As the carriage is lowered to loading position, the false table tilts and automatically unloads the work. All the operator has to do is to load the two parts onto the



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THE CLEEREMAN MACHINE TOOL CO  
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carriage table and then trip the foot pedal.

Four of the tools used on the machine, together with the parts which were broached, are shown in Fig. 3. The large yokes are 3 7/8-in. diameter inside with a 11 3/32-in. wall and vary in length from 6 to 7 1/16 in. The broaching tool in 58 in. long with 52 teeth which remove approximately 0.035 in. of stock

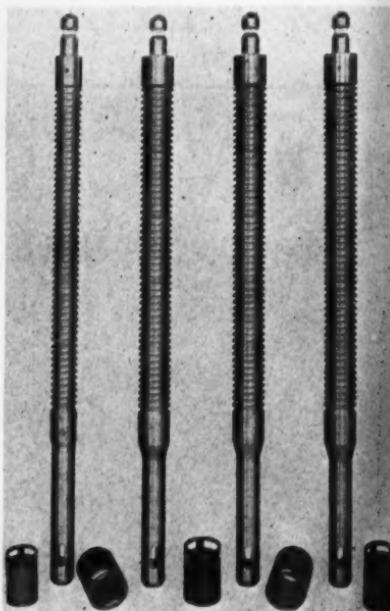


Fig. 3—Oilgear Cyclematic Broaching Tools and Work-Pieces

from each yoke. The largest of the tools weighs 260 lbs.

The upper end of each tool is inserted in a detent attached to the upper tool holder crosshead which engages the four notches in the upper end of the tool and thus holds the tool in place during the loading operation and the major portion of the broaching stroke. The lower end of the tool has a slot through which a key is automatically inserted to hold the tool in position during the operation. The broaching teeth of each tool are built in sections so that the roughing section can be discarded when worn and the other sections moved forward.

Among the features of the machine are the fact that the work is loaded at a convenient level, the large, heavy tools

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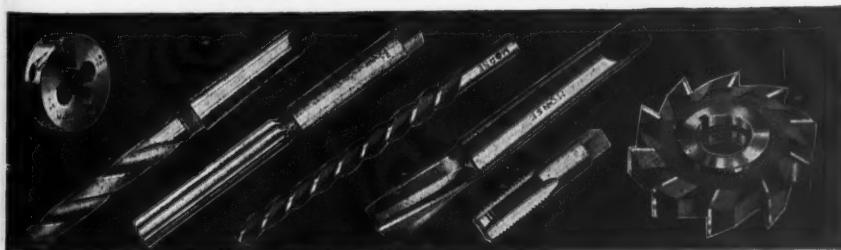
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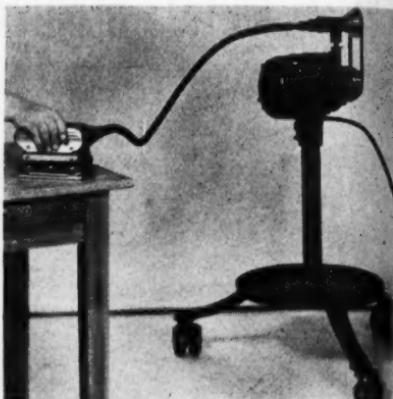
**MORSE**TWIST DRILL & MACHINE COMPANY  
NEW BEDFORD, MASSACHUSETTS, U. S. A.

are handled quickly, smoothly and automatically, work is centralized and threaded over the tools automatically, the cycle is started by operation of a simple foot threadle, and the work is ejected mechanically.

### Sterling "Floating Block" Electric Sander

An electric sanding and rubbing machine designed to operate with a reciprocating action has been brought out by Sterling Products Company, 314 Custis Bldg., Detroit, Mich. The machine is driven by electric motor through a flexible shaft. The sanding action is reciprocal with  $\frac{1}{8}$  in. travel of the sanding pad at speeds from 1750 to 2800 complete oscillations per minute, depending upon the type of work upon which it is to be used. This movement is intended to duplicate the natural back-and-forth motion of hand sanding and rubbing.

The principle of "floating" as applied to the construction of the block is an exclusive patented feature. Flexible rollers of special composition rubber and fabric are attached floatingly by pins to the sander block and special pads of varying flexibilities are available.

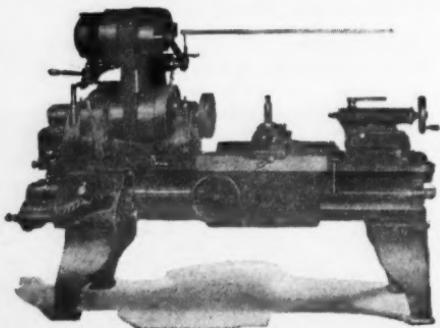


Sterling Bench Height Pedestal Model Electric Sanding Machine

The construction of the machine is such that there is no restriction in the movement of the block. The machine is applicable to curved and flat surfaces of metal, fabric, wood, composition, leather and marble, and for such delicate operations as the finishing of stringed musical instruments, buffing of

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When you think of Texas you should realize that when doing mechanical and metallurgical work down there they do it with the most modern equipment. This photograph was taken at the plant of MISSION MANUFACTURING CO., Houston.

A lot of plants north of Texas geographically are south of Texas in manufacturing methods and equipment.

**WILSON MECHANICAL INSTRUMENT CO., INC.**  
CONCORD AVENUE AND EAST 143rd STREET NEW YORK, N. Y.



**View of Sterling Sander Head Showing the "Floating Block."**

leather, as well as the heavier production requirements of finishing machinery, auto bodies, and railway cars.

The machine is designed for wet or dry sanding and finishing. For wet operation, a water connection is provided with a series of openings on each side of the block, providing a spray that is readily adjustable to the requirements of the job. For gas sanding with naphtha, gasoline and benzine, a special block with Sterlite base is provided. From one to five sheets of abrasive may be attached to the pad at one loading.

ordinary size sheets being cut in three pieces without waste.

The machine is portable and may be operated from any electric outlet, either 110 volt or 220 volt. Three different types of mountings are provided: the bench plate type with motor mounted on a metal plate for use on the work bench, the ceiling suspended type with the motor suspended from the ceiling or an overhead monorail by means of ball-type handles, and the bench height pedestal model with a three-leg caster base.

Perfect balance of the sander head and the light weight of  $7\frac{1}{2}$  lbs. plus the compact dimensions of 7 in. long by  $4\frac{3}{4}$  in. high and  $3\frac{3}{4}$  in. wide are said to make the machine extremely responsive to the guidance of the operator in any position and provide a comfortable fit to the palm of the hand.

#### **Wahlstrom Variable Depth End Stop Chuck**

A drill chuck so designed that it will hold the drills in such manner as to prevent either endwise or rotary slippage has been brought out by the Wahlstrom Tool Division of American Machine & Foundry Co., 55th St. and Sec-

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Fingers become geared to  
the knurled "Unbrako"  
and therefore can't slip



# UNBRAKO

## Socket Head Cap Screw

Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster, as his fingers actually become geared to the Knurled Head so they can't slip.

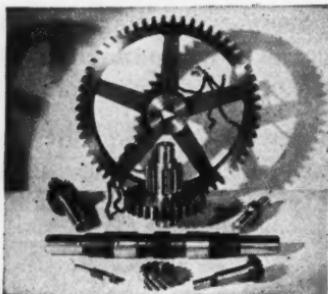
Smooth Head Screws, hard to get hold of are much slower to drive.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako",—

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ond Ave., Brooklyn, N. Y. The manufacturer states that this unique chuck positively will not permit end slippage, and if the jaw chamber is kept clean of dirt and chips so that the jaws can function properly, the drills will not slip when under pressure. The construction of the chuck is such that it does not depend on side pressure to prevent end slippage.

The chuck is made in two sizes. The  $1/64$  to  $1/4$ -in. variable depth stop chuck is  $1\frac{1}{8}$ -in. diameter and will hold drills within  $\frac{1}{8}$  in. of the end. For shorter gripping length, special plungers must be used and the drill can then be held



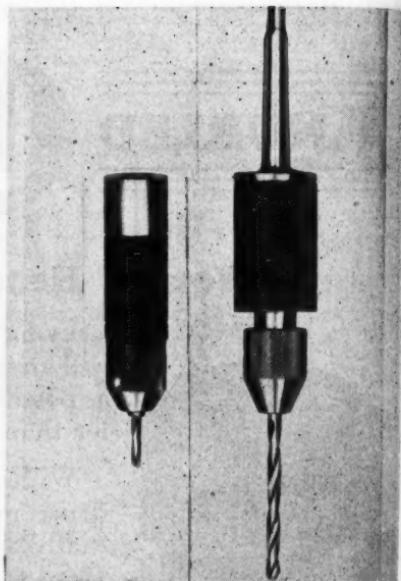
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Wahlstrom Variable Depth End Stop Chuck

$\frac{1}{4}$  in. from the end. For drill sizes from No. 26 to No. 42, the variable depth stop chuck, which is 1-in. outside diameter, will hold drills up to  $\frac{1}{4}$  in. from the end and does not require special plungers. Both sizes of the variable depth stop chuck will drive equally well on the flutes and on the shanks.

#### Chambersburg Improved Forging Hammer Slide Valve

Chambersburg Engineering Co., Chambersburg, Pa., has developed a slide valve which, according to the manufacturer, materially increases the efficiency

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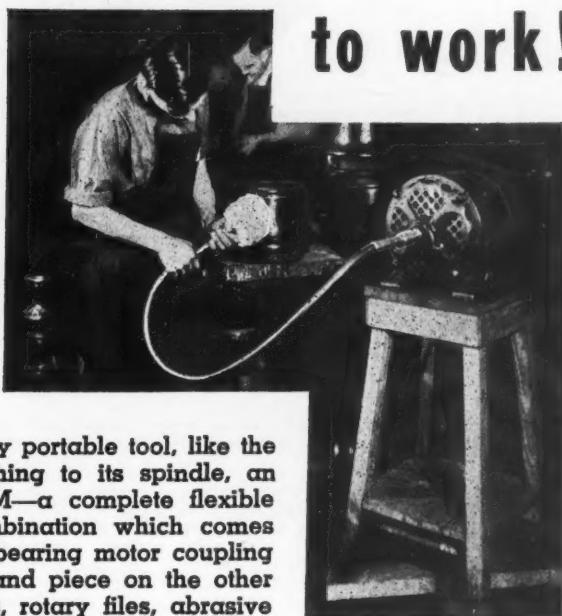
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Convert it into a handy portable tool, like the one shown, by attaching to its spindle, an S. S. White FLEXARM—a complete flexible shaft and casing combination which comes equipped with a ball-bearing motor coupling on one end, and a hand piece on the other for holding burs, drills, rotary files, abrasive points, disks, wheels and many other tools.

You simply slip the coupling of the FLEXARM over the motor spindle, tighten the set-screw, and you have a tool with which you can do die-sinking, drilling, grinding, buffing, burring, polishing, lapping, reaming and a great many other operations.

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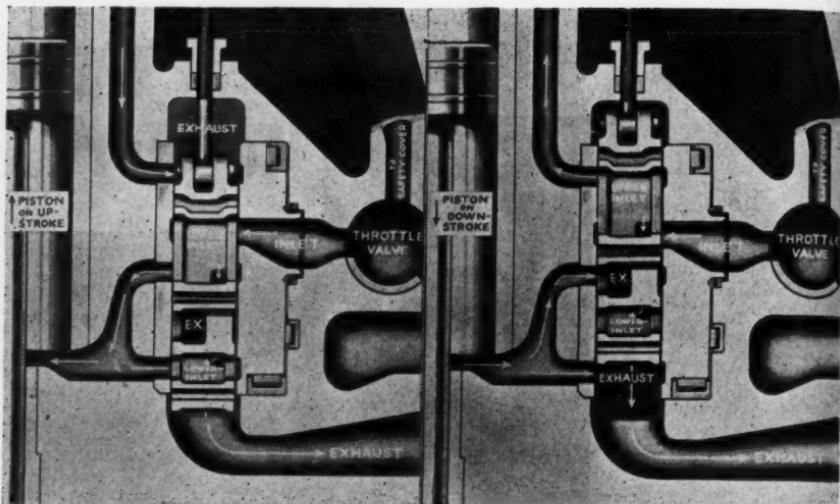
**The S. S. WHITE Dental Mfg. Co., INDUSTRIAL DIVISION**

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**FLEXIBLE SHAFTS FOR POWER DRIVES AND FOR REMOTE CONTROLS**

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Chambersburg Slide Valve. (Left) Large lower cylinder inlet produces fast return of ram. (Right) Minimized back pressure under piston assures powerful down-stroke.

of a steam or air-operated drop forging hammer. The valve is so designed that it distributes the steam or air to the cylinder internally, under the piston on its up-stroke and above it on the down-stroke. Inlet and exhaust, alternate of course, above and below the piston.

Comparatively little energy is required to accelerate the falling ram to proper forging velocity, back pressure under the piston being eliminated by the large lower cylinder outlet. The relatively large lower cylinder inlet, however, produces a fast return of the ram and back pressure built up above the piston on its up-stroke assures strong subsequent blows. Also, by reducing the piston's upward speed, it protects the cylinder cover.

This design is a distinctive feature of the Chambersburg valve, compared with the conventional type which follows steam engine practice in being designed to produce equal speed at each end of the stroke. In the Chambersburg design, multiple ports to the lower end of the hammer cylinder provide the proper relation of passage areas for applying the power necessary to attain the scientifically determined velocities essential to maximum energy in forging.

By utilizing the internal pressure to limit the clearance between the slide valve and its plate faces, proper lubrication with minimum leakage is obtained and is controlled by setting the adjustable plate to predetermined lim-



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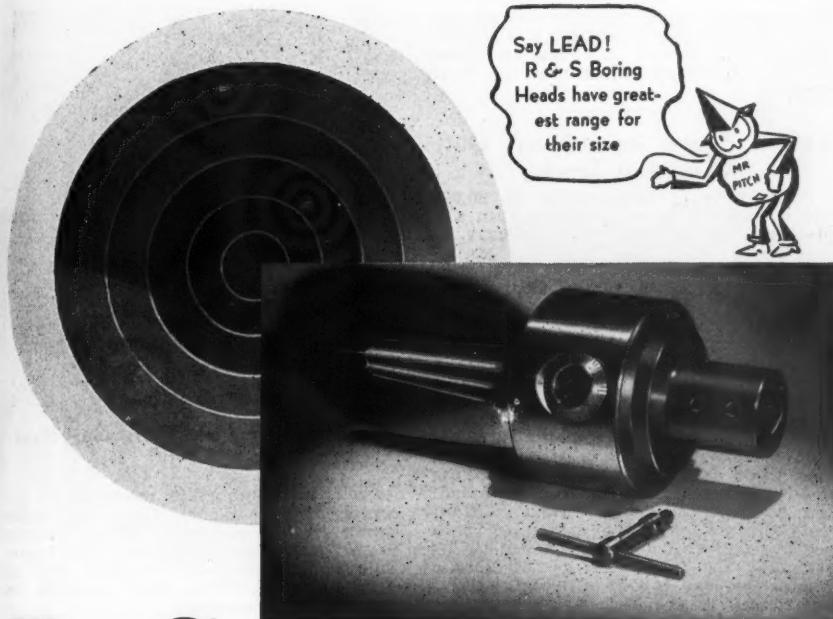
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The RICKERT  
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Adjustable Boring Heads; Collapsible Taps  
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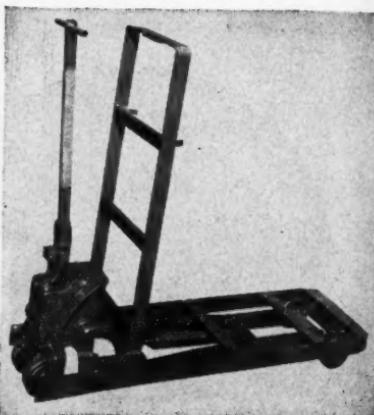
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its, depending upon the pressure of the steam or air used. Adjustment is readily made when needed although in three years of service no adjustment has been required.

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Loads ranging from 10,000 to 20,000 lbs. that have to be moved within the plant can be handled very efficiently by the use of the Yale Type XB Multi-Stroke Super Heavy Duty Hand Lift Truck illustrated herewith. The truck is a product of the Yale & Towne Mfg. Co., Philadelphia, Pa. It is claimed by the manufacturer that a multi-stroke lifting head with chain lift permits a fair-sized man to lift the load without straining.

Six-inch face steel wheels with 3-in. face twin front wheels make it possible to move heavy loads of machinery, dies, steel and so on without breaking or damaging floors. Large sealed ball bearings, well lubricated, check friction; thus the load may be moved by man power. The work may be speeded up by attaching the truck to a gas or electric tractor. A load can be dropped without a jar, due to the use of hydraulic re-



**Yale & Towne Super Heavy Duty Hand Lift Truck**

lease checks which are mounted in the center of the frame. Long life under severe service is assured by the massive lifting head and reinforced bar frame. Yale Super Heavy Duty models may be furnished with lifting frame suitable for varying requirements.

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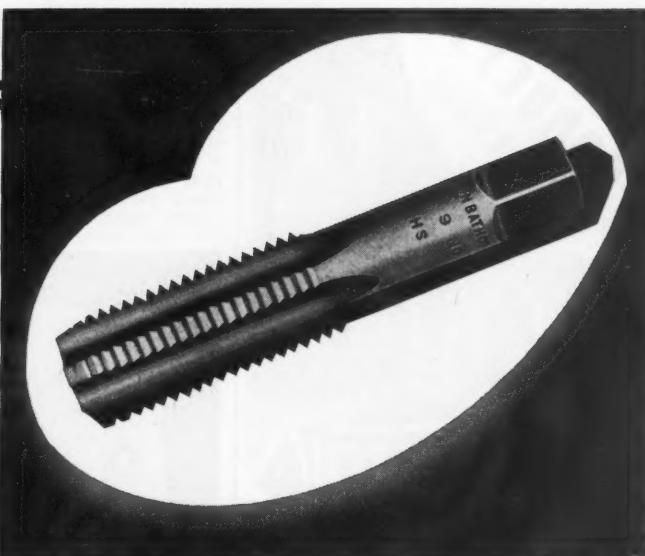
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### Cataract Enclosed Head Bench Type Vertical Milling Machine

A precision bench type vertical milling machine with ball bearing spindle construction for efficient operation at high spindle speeds has been brought out by Hardinge Brothers, Inc., Elmira, N. Y. The machine is designed to simplify intricate milling operations on small parts.

The feature of the machine is the



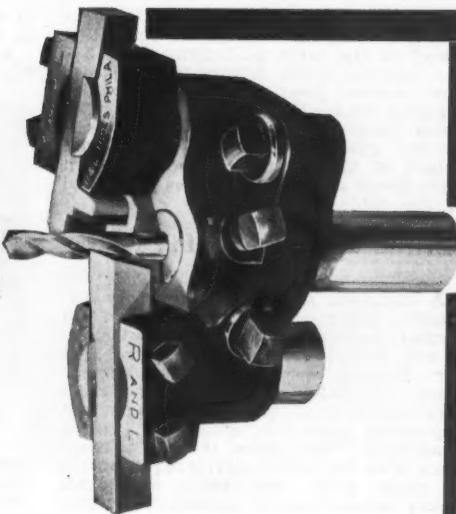
### Cataract Enclosed Head Bench Type Vertical Milling Machine

spindle construction, which embodies precision preloaded ball bearings of the double row type, providing maximum rigidity with a minimum of friction. Such a design affords high spindle speeds with extreme precision and overcomes radial and end play which are a detriment to milling operations. The machine is fully enclosed so as to exclude dirt, chips, and so on, and also to protect and guard the driving belts to the spindle. An electrical driving unit, mounted under the bench, provides eight spindle speeds up to 5000 r.p.m. The drive does not, however, include clutches, driving gears or loose pulleys. The two levers at the left side of the machine afford convenience in the operation of electrical switches for low or high and feed or reverse spindle speeds.

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**Change from  
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work



● This money-saving R and L tool can be changed from Right to Left—or Left to Right in 10 seconds—an exclusive patented feature! Why pay five times as much for an assortment of Right and Left handed tools when you can get one tool capable of producing the same amount of work at a comparatively low cost?

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The working surface of the table is 12x3½ in. and the micrometer controlled travel of the table is: longitudinal, 5½ in.; transverse, 3½ in.; vertical, 5¾ in. The vertical head has a ½-in. collet capacity for holding milling cutters. The index heads are ½ or ¾-in. collet capacity. The machine has an overall height of 22 in. and requires a bench space 23x22 in., which includes the travel of the table.

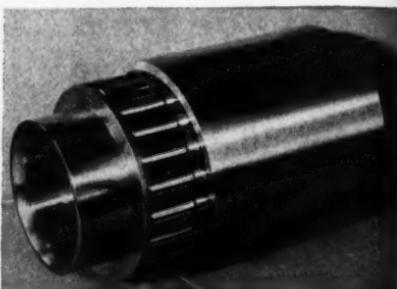
### Extended Range of Fafnir Roller Bearings

A complete series of heavy-duty industrial roller bearings, made in an extended range of almost a hundred sizes is now being manufactured by the Fafnir Bearing Company, New Britain, Conn. The rated capacity of these bearings ranges from 10,000 to 500,000 pounds, depending upon size, speed and loading conditions. The series is said to cope fully with the severe service requirements of paper mills, steel mills, and other heavy metal-working machinery, rubber and oil field equipment, and the like.

In the widened range of bearing sizes, rollers of ¾-in., 1¼-in. and 1½-in. diameter have been utilized in addition to the 1-1/16-in. diameter used in the bearings previously available. A choice

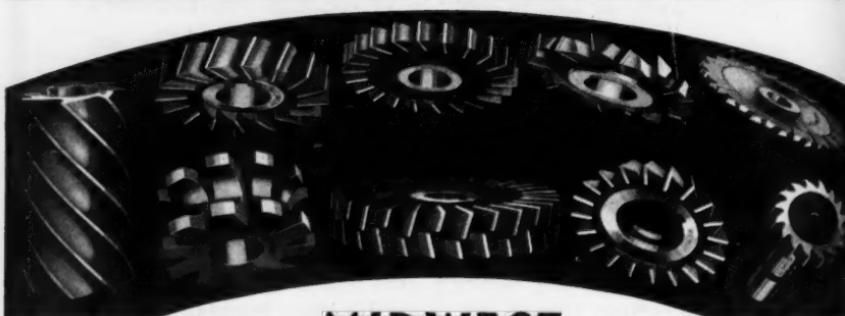
of eighteen different bores is now offered in bearings of this type.

A feature of these roller bearings is the large number of solid rolls which



Fafnir H. D. Industrial Roller Bearing

are incorporated in the cage assembly, thus making for increased load capacity. The cage itself is fabricated from specially form-rolled spacer bar stock, with carburized and hardened end rings. Rollers are held in place and guided by spacer bars rather than by rivets through the rolls themselves, which of necessity tend to weaken the capacity of



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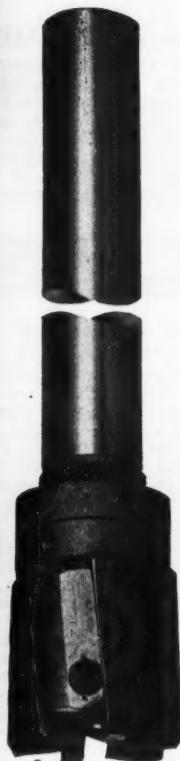
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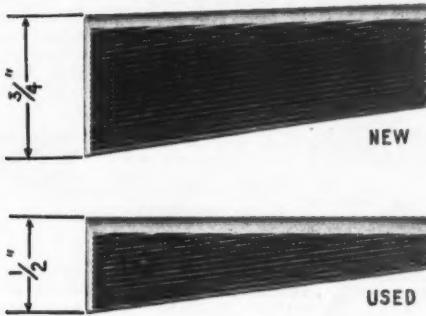
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Note that the length has not changed, all the stock removed from the used blade was utilized to replenish the diameter for resharpening and adjustments can be as small as desired (no portion has been ground away because of excessive overhang).

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**Goddard & Goddard Co.**  
**DETROIT, MICH.**

the roll. The spacer bars of the Fafnir cage are riveted to the end ring, and the accurate assembly of these bars keeps the rolls permanently aligned.

The entire roller assembly is made with a fixed radial clearance to allow for the expansion which takes place when the inner ring is shrunk to the shaft, this being the standard method of mounting for the roller type bearing. This clearance likewise permits the bearing to operate successfully and without impairment should temperature dif-

ferentials occur in actual operation—that is, a certain amount of expansion due to heat can be taken care of without seriously affecting the relationship of the bearing parts.

All parts of these roller bearings are precision-ground, and held to extremely close tolerances. Complete specifications, including dimensions, tolerances and load ratings, are available on request.

### Weldon "Parabolic" End Mill

The Weldon Tool Co., 321 Frankfort Ave., Cleveland, Ohio, is now marketing a double-end end mill, the design of which incorporates several unique features which permit it to be fed into the work at a very high rate of speed without risk of breakage. The end of the new mill is deeply cupped and the spaces



**TOOL POST  
TURRET**

**SAVES TIME!  
CUTS COSTS!**

4 indexing positions—  
tools mounted direct  
on square turret.  
Series 98-B without  
tools, \$15 — with 4  
tools, boring bar and  
cutting-off tool,  
\$16.80 f. o. b.

**S. G. COLWELL**  
25 Congress Ave.  
Providence, R. I.

Series 98-B for 9" South Bend, Stark No. 41 or other lathes of same size.  
Write today — advise make and size lathe.



**BREUER'S BALL BEARING TORNADO PORTABLE ELECTRIC BLOWER**

**BLOWS** powerful 275 M.P.H. blast of air into motors and machines. Drives out dust and dirt. Prevents fire, friction, burnouts and shut-downs. **VACUUM** cleans stock bins, shelves, overhead pipes, walls, rugs, etc. **SPRAYS** Insecticides. 1 H.P. motor. Most powerful blower built — 46 1/4" waterlift.

Free trial—no obligation  
Write

**BREUER ELECTRIC MFG. CO.**  
843 Blackhawk St.  
Chicago, Ill.



Weldon "Parabolic" End Mill

between the flutes are made unusually wide so that the chips will be ejected and breakage of the end mill due to clogging of the chips under the end and in the flutes will be eliminated. Tests have shown that the new mill will take a feed as high as 14 in. per minute on a  $\frac{5}{8}$ -in. diameter mill working on oil-hardening tool steel.

The teeth are designed on a parabolic curve, which is said to make possible heavier flutes without decreasing the chip clearance, thus providing increased strength in the teeth. The cupped end provides clearance for the teeth at the end of the mill and thus eliminates the principal cause of breakage. Flutes are hollow ground in the regular Wel-Don manner with the usual double back-off and fast spiral.

### Here's a Real Spring Winder!

No. 1 Capacity 0 thru  $3/32$ " wire, \$1.25  
No. 2 Capacity 0 thru  $3/16$ " wire, 2.50  
No. 3 Capacity 0 thru  $5/16$ " wire, 5.00



**HJORTH LATHE & TOOL CO.**

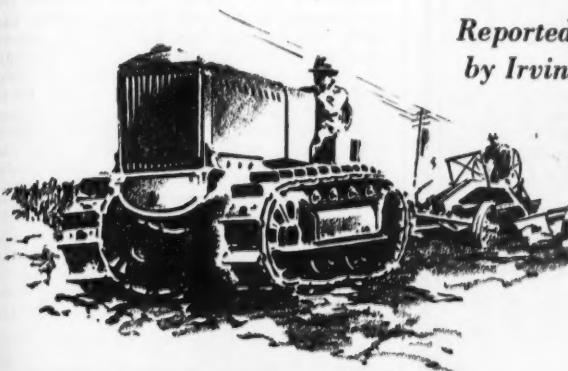
Will Earn Its Cost in one Day

The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

12 BEACON STREET  
WOBURN, MASS.

## MAXI-FACTS from New York State

Reported  
by Irvin



"Greenfield" distributor in New York State reports:

"The  $\frac{3}{8}$  'Maxi' pipe tap ordered July 8 for our customer . . . has done more work than any other tap they have ever used on this machine."

# STURDY

"More work than any other tap they have ever used" . . . Does that sound too strong? Listen! Detroit—"36 times greater production"—Ohio—"Tapped 1200 holes . . . previous record 80." And more are coming in every month—from New York—from Chicago—from everyone who tests "Maxi" tools.

The secret is in the surface treatment—developed specially by "Greenfield" to meet the requirements of modern industry. They effect a two-fold saving—tool costs and production time.

But don't take our word for it. Try "Maxi" taps, or other "Maxi" finished "Greenfield" tools in your own plant—under your own production conditions. Ask your distributor for full particulars.

### GREENFIELD TAP & DIE CORPORATION

GREENFIELD, MASSACHUSETTS  
Detroit Plant: 2102 West Fort Street  
Warehouses in New York and Chicago  
In Canada: Greenfield Tap & Die Corp. of  
Canada, Ltd., Galt, Ont.

# GREENFIELD

*Maxi* *they're* *Black* *Tools*



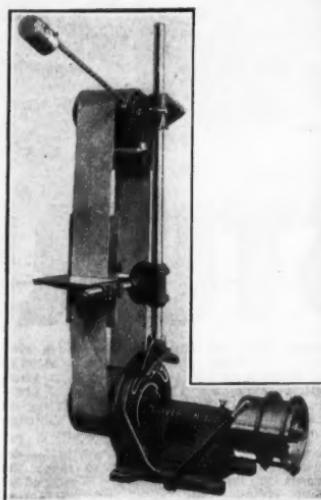


**P**OSITIVE action . . . long, trouble-free life . . . that's what you are assured in Ruthman "Gusher" Pumps, featuring such advancements as, Simplified Design; Elimination of all packing glands . . . positive gravity feed . . . no metal to metal contact . . . protected Ball Bearings . . . low power consumption. Follow the example of the majority of leading machine tool builders, specify Ruthman "Gusher" Pumps for original or replacement needs. Write for Free Data Sheets.

**GUSHER COOLANT PUMP**  
The RUTHMAN MACHINERY Co.  
503 EAST FRONT STREET—CINCINNATI, OHIO

### Oliver Variety Belt Grinder and Polisher

The illustration shows a flexible and adaptable belt surfer and polisher for both metal and wood working which has been placed on the market by Oliver Machinery Company, Grand Rapids, Mich. The machine is designed for rapid belt grinding and polishing of all kinds of small and medium-sized metal pieces of convex, concave or irregular shapes, edge work, and flat surfaces, and has proved highly efficient on ornamental



Oliver Variety Belt Grinder and Polisher

metal work, compositions, and wood.

An outstanding feature of the machine is the fact that it can be used in either vertical or horizontal position. As shown, the machine is set for use in the vertical position, but it can easily be swung to any angle in an inclined position. The backing place can be moved in or out, the table can be tilted up or down, and the arm or post together with the idler pulleys and the table may be inclined to the right or left.

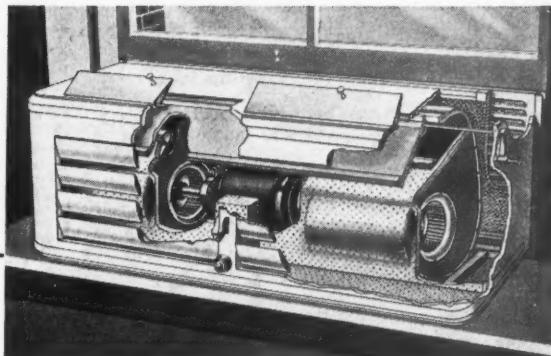
The main drive pulley is mounted on a countershaft located in a substantial base. A support arm carries two clamp brackets, one of which supports the main idler pulley and the tension idler while the other supports the table and backing plate or any forms or flexible pads which may be required. The machine will take belts up to 10 in. wide and 14 ft. long.

**A Parker-Kalon Assembly Engineer  
can quickly prepare you to do what S.A.C. did—**

**CLIP 40% OFF ASSEMBLY TIME**

When design and production men thoroughly understand the uses for Hardened Self-tapping Screws important economy opportunities are often opened-up. A. F. Pettet, Mgr., Standard Air Conditioning, Inc., makes this clear in telling about a 40% saving in assembling the AIR PILOT . . . an appliance which provides fresh, filtered air and eliminates outside noises.

**STANDARD AIR CONDITIONING INC.**  
A DIVISION OF AMERICAN INDUSTRIAL & STANDARD CARPET CORPORATION  
SECOND STREET AND BEECHWOOD AVENUE  
POST OFFICE BOX 16503  
NEW ROCHELLE, NEW YORK



July 15, 1936

Parker-Kalon Corporation,  
200 Varick Street, New York

Gentlemen:

When the design of our AIR PILOT was started your Hardened Self-tapping Screws were specified for fastenings on all sheet metal parts and assemblies. Approximately forty of the Screws are used in each unit.

Because our Engineering Department had a thorough understanding of these Hardened Self-tapping Screws we estimate that a saving of 40 percent in assembly time is effected. In addition to this, the various assemblies are made so securely that they cannot loosen, although they can readily be dismantled and assembled again for servicing work with an ordinary screw driver.

Very truly yours,

STANDARD AIR CONDITIONING, INC.

  
A. F. Pettet,  
Manufacturing Dept.

**Let a PARKER-KALON ASSEMBLY  
ENGINEER prepare you to take  
advantage of such opportunities**

Assistance, not selling, is the function of Parker-Kalon Assembly Engineers. They stand ready to tell you what you need to know about Parker-Kalon Hardened Self-tapping Screws so that you will not miss opportunities. Or, to make a study of your present metal or plastic fastening jobs or new designs with the idea of employing the modern, simpler assembly method where practicable to reduce time and labor costs, improve design and strengthen construction.

At your invitation we will put you on the schedule of one of these practical assembly experts. When you consider that worthwhile benefits have resulted in 7 out of 10 cases where they have been called in, don't you think it would pay to write us, NOW?

PARKER-KALON CORPORATION  
Dept. M, 198 Varick Street New York

**PARKER-KALON Modern FASTENING DEVICES**

A HARDENED SELF-TAPPING SCREW FOR EVERY KIND OF ASSEMBLY

**SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS**

The edging table, which is 10x12 in., is of cast iron. The table tilts to any angle up to 30 deg. either up or down, and can be adjusted in or out. Drilled holes provide for attaching wood tops or forms. The backing plate is 10 in. wide and can be adjusted in and out to provide suitable tension on the belt. The main idler runs in ball bearings and is adjustable up or down the whole length to take care of various lengths of belts. This pulley is faced with rubber. The tension idler, which is also rubber faced, is of the ball bearing type and fulcrums in the center line of the main idler, weights being provided to give the right tension to the belt.

A fork idler can be mounted on the machine in place of the regular table for grinding and polishing oval frames and other irregular shapes. The fork idler is rigid in construction and carries two aluminum idlers which run in ball bearings and are adjustable to the work. The countershaft is 1 1/2 in. in diameter and runs in roller bearings. The driving pulley is 14x10 in. and is rubber faced. The tight and loose pulleys are 10 in. in diameter with 5-in. face. Speed is 900 r.p.m. Height overall, 80 in.; floor space required, 4x8 ft. For motor drive a 2 h.p. totally enclosed fan cooled motor of approximately 900

r.p.m. is direct connected to the lower drive pulley.

### Synthane Noisometer

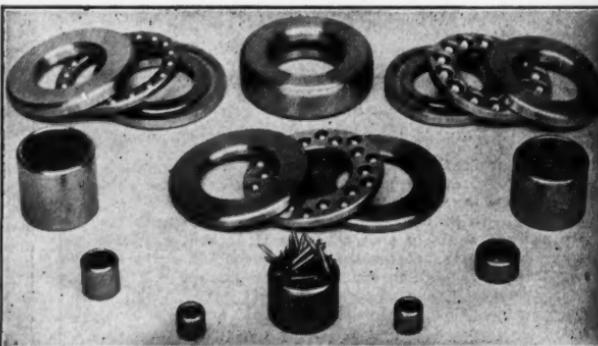
In order to make visible the difference in gear noises made by Synthane laminated bakelite gears and metal gears, the Synthane Corporation, Oaks, Pa., has brought out a device called the Synthane "Noisometer."

The Noisometer consists primarily of two parts, a cathode ray oscillograph and a train of spur gears. The gear train is so arranged that through a gear shift lever either a Synthane laminated bakelite gear or a steel gear can be thrown in mesh in the intermediate position. Driver and driven gears are of steel. The Synthane and steel intermediate gears are cut at the same setting and keyed to the intermediate shaft.

In the illustration, the Synthane gear is shown in mesh. By pulling the shift lever forward, the steel gear can be cut in while running. Thus, a comparison of the noises can be quickly made by ear. A more accurate, graphic comparison can, however, be made by eye at the same time. A microphone is mounted on the panel in back of the gears. Noises generated by the gears are

## 800% GREATER DEMAND

THAT'S the way industry has been flocking to Bantam for bearing requirements, whether they be Ball Thrust, Roller Thrust or Journal Rollers. An 800% increase in demand since 1932. After all, "the proof of the pudding is in the eating," so why not try Bantam Bearings once? From them on your own good judgment will bring you back for more.



#### Write for NEW Catalog

Every designing engineer in the country should have a copy of this book. It shows a comprehensive picture of the bearings which are saving money for manufacturers of small and large machinery. Send for catalog No. 101 TODAY!

**THE BANTAM BALL BEARING CO.**

South Bend, Indiana



TAKE YOUR TOUGHEST BEARING JOB TO BANTAM





# THE EYES HAVE IT!

## THE OPPORTUNITY TO VIEW 24,273 ITEMS

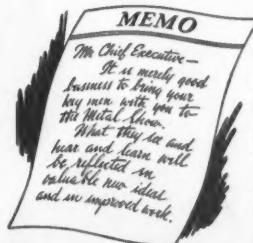
THE greatest collection of new products, new materials and new processes in the metal industry will be presented at the eighteenth annual National Metal Exposition, to be held in Cleveland's vast Public Auditorium, Monday through Friday, October 19 to 23.

You will see hundreds of exhibits portraying the important developments of the year in your industry. You will be able to compare and consider, at one time and in one place, a huge variety of new equipment. You will have all the advantages of a gigantic working laboratory where you can readily observe comparative operating advantages.

You will find ideas in every aisle and in every exhibit. Be one of the thousands who will attend this year's Show!

N.B. . . The Exposition itself would amply repay you for your visit to Cleveland. But the Exposition is only half the attraction. The other half is the National Metal Congress, where five great national Societies will cooperate to present programs studded with authorities from every branch of the metal industry. More than 175 experts have cooperated to prepare 107 talks on production, selection, fabrication, testing, inspection, treatment, welding and application of all kinds of metals. If you haven't made your hotel reservations, do so today.

- For complete details regarding programs and exhibitors, write  
W. H. Eisenman, Managing Director, National Metal Congress  
& Exposition, 7016 Euclid Ave., Cleveland, O.



# NATIONAL METAL SHOW

CLEVELAND, OHIO

PUBLIC  
AUDITORIUM

OCTOBER 19-23, 1936

### COOPERATING SOCIETIES

AMERICAN SOCIETY FOR METALS

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

— AMERICAN WELDING SOCIETY

THE WIRE ASSOCIATION

**Cut Cost**  
of removing  
broken taps  
with  
**WALTON TAP  
EXTRACTOR**

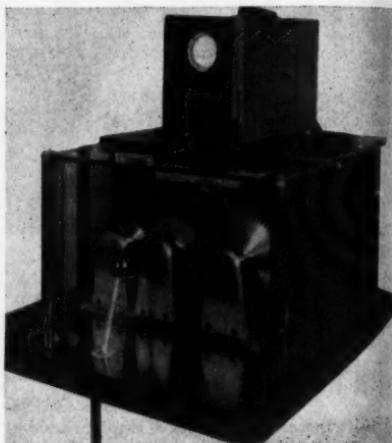


Here is a practical, indispensable tool for removing broken taps quicker than any other known method. When the tap breaks off at or below the surface of the work, simply insert the Walton Tap Extractor's fingers into the flutes of the broken tap and back it out, with no damage to the threads. This tool will usually pay for itself in removing the first broken tap.

Try it on 60 days free trial offer. Write for complete details.

**THE WALTON COMPANY**  
98 Allyn St.  
Hartford, Conn.

picked up by the transmitter and relayed to the cathode ray oscilloscope mounted on top of the unit. Noises are reproduced as a pale green line on the screen of the cathode ray tube, the height of the wave, or amplitude, repre-



Synthane Noisometer

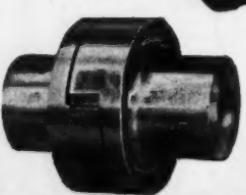
senting the volume of noise. The two curves below show relatively the noises made by the gear train with Synthane and steel intermediate gears.

**Bond** STOCK GEARS, SPROCKETS, SPEED REDUCERS AND FLEXIBLE COUPLINGS.

**"B" TYPE SPEED REDUCER**  
Ask for Catalog M-57



**FLEXIBLE COUPLING**  
Ask for Leaflet MF-10



Patent No. 2,003,848, June 4, 1935

**CHARLES Bond COMPANY**  
617-623 Arch Street, Philadelphia, Pa.

### Stanley Electric Soldering Irons

The Stanley Rule & Level Plant, New Britain, Conn., has brought out a line of electric soldering irons. These Stanley Electric Soldering Irons are said to be of improved design and operate efficiently and economically on either A.C. or D.C. current.

Correctly proportioned and well bal-



Stanley Electric Soldering Iron

anced, the soldering irons have adjustable, ventilated handles. By means of a lock collar and sleeve, the handle can be adjusted to desired length and rigidly tightened. The handle is also removable.

The soldering irons have compressed pure copper tips, accurately machined for a valve-fit connection with the heating heads, to assure effective heat conduction and to protect metal connecting surfaces from oxidation and flux cor-

# PRODUCE AT A PROFIT

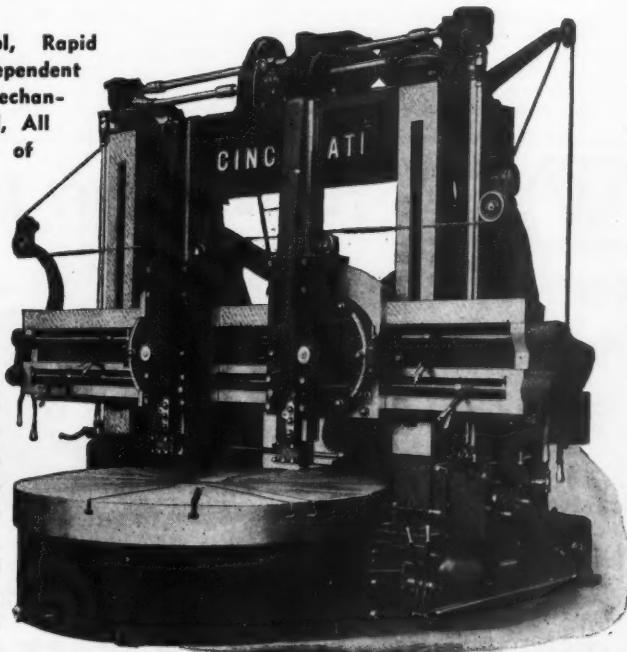
with the

# CINCINNATI BORING MILL

**PROFITABLE** Production demands the most up-to-date, most efficient equipment available . . . and that means "CINCINNATI" equipment—Planers, Planer Millers, Boring Mills.

The CINCINNATI Boring Mill (shown below) is a thoroughly modern tool in every respect, incorporating into its design and construction a host of features which insure higher production, improved quality, and greatly reduced costs. Among these features are:

Centralized Control, Rapid Power Traverse, Independent Feed Gear Box Mechanism for Each Head, All Gears and Racks of Steel.



Visit the plant nearest you using "CINCINNATI" equipment and study the performance of these modern tools . . . you'll be convinced of the wisdom of an investment in a "CINCINNATI".

Write or wire for detailed information.

**THE CINCINNATI PLANER COMPANY**  
CINCINNATI OHIO

rosion. Hermetically sealed heating heads protect the "built-in" windings and solid copper cores from air, flux fumes and moisture.

There are eight different sizes of Stanley Soldering Irons, ranging from 52 watts with a 7/16-in. tip to 435 watts with a 1 9/16-in. tip. Each iron is equipped with a 6-ft. flexible heating cord with an effective cord strain relief, attached to convenient terminals. A metal resting stand is furnished with each tool.

### Bruning Drafting Machine

A saving in drafting time of 25 to 40 per cent is possible by the use of the new Bruning Drafting Machines now being marketed by the Charles Bruning Company, 102 Reade St., New York, N.Y. The line includes the Standard Drafter, the Civil Engineers' Drafter and the De Luxe Civil Engineers' Drafter.

Each of the new machines is equipped with an adjustable brake mechanism which prevents the protractor head from sliding excessively when used on an inclined board. Each machine also has adjustable skid buttons for leveling the scales. Pulleys are fully enclosed and the bands may be changed if necessary without disassembling the machine.

Each machine is equipped with New Departure precision fully enclosed ball bearings which are lubricated for life. Each machine also has an elbow leveling device. All parts are of dull finish



Bruning Standard Protractor Drafting Machine in Use

aluminum or baked enamel, entirely eliminating reflection.

The Standard Protractor model of the Bruning Drafting Machine is designed for the use of draftsmen on all lines of work. The Civil Engineers' model is intended for use by map draftsmen and navigators. The De Luxe Civil En-



## FLEXIBLE SHAFT MACHINES

**COMPARE QUALITY! COMPARE PRICE!**

### Heavy Duty Grinder

FOR CASTINGS,  
WELDS, ETC.

7 FT. LONG  
FLEXIBLE SHAFT  
5/8" DIA. CORE.

ALL WYCO  
SHAFTS HAVE  
NON-METALLIC  
FRICTIONLESS  
INNER LINER.

WRITE FOR  
CATALOG No. 36

1 H.P. 3450 R.P.M.  
**\$105.00**

COMPLETE AS  
ILLUSTRATED



**MODEL No. 4-B**

**WYZENBEEK & STAFF, Inc.**

642 WASHINGTON BLVD.  
CHICAGO, ILL.

h New  
ed ball  
or life,  
level-  
finish

**Ettco - Emrick**

*for better and faster*

## SMALL TAPPING

FOOT OPERATED—HIGH SPEED—SENSITIVE  
VERTICAL TAPPING MACHINES

The good reason for this machine is that it gets out two or three times as much work as the average drill press with a tapping attachment.

• • •

The tooling charges are Low. The built-in stripper will alone pay for the machine.

• • •

And the operator! He will like the effortless balanced gravity foot treadle, which he can adjust to the weight and length of his leg.

Both hands are free. Tap lubrication is automatic. Just step on the treadle—Tapping will take care of itself.

SKILL IS BUILT INTO THE MACHINE

• • •

For real production hounds we equip the machine with our small multiple heads—And that IS fast tapping.

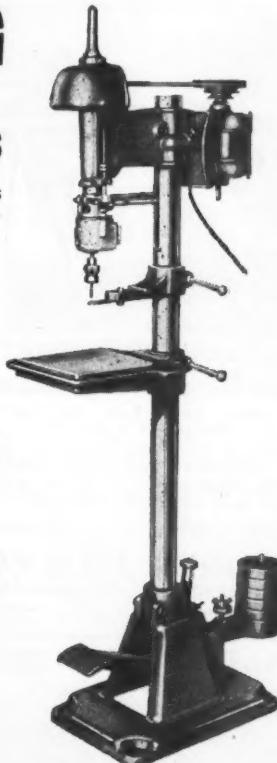
• • •

THE PRICE IS AROUND \$200.00

(According to kind of motor)

The capacity is up to 5/16" in soft metals.

The speed is from 900 to 2100 R. P. M.



PATS. APPLIED FOR  
See Bulletin No. 2 for  
seven sizes of Tapping At-  
tachments for use on Drill  
Presses.

**ETTCO TOOL CO.**

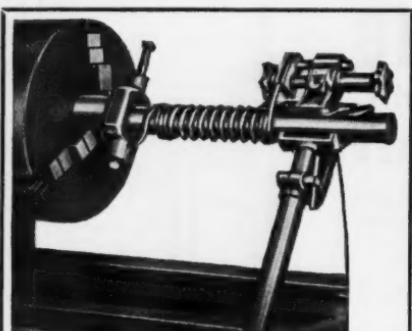
596 JOHNSON AVE., BROOKLYN, N. Y.

**ASK US ABOUT MULTIPLE TAPPING**

gineers' model has the same features as the Civil Engineers' model with the addition of a micrometer adjustment screw tangent to the protractor which greatly aids in rapidly and accurately setting off the required angles.

### Starrett No. 454 Vernier Height Gage

The L. S. Starrett Co., Athol, Mass., has brought out a gage designed for measuring and inspecting work on which an extremely high standard of accuracy must be maintained. The gage shown



### WIND YOUR OWN SPRINGS

With this Superior Machine on Lathe or Vise

How many times have you needed a spring—in a hurry?

SUPERIOR could have wound it for you  
—PERFECT and UNIFORM—

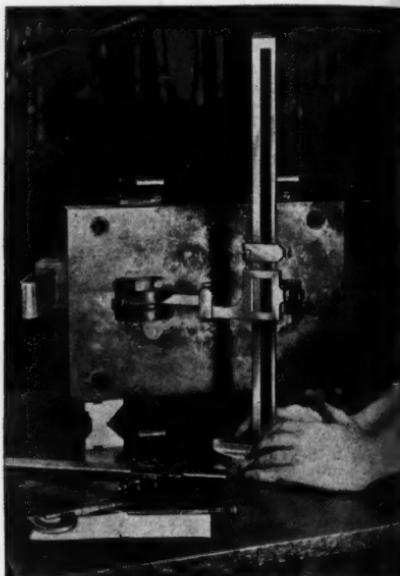
Capacity—Hairspring to  $\frac{1}{4}$  in. tempered  
steel wire—Maximum diameter 2 in.

Write for Circular "A" and price.

**SUPERIOR SALES CO.**  
549 W. RANDOLPH ST., CHICAGO, ILL.

in the illustration has a range of 18 in., but 24 and 36-in. gages can be furnished when needed.

The bar is graduated on one side only,



Starrett No. 454 Vernier Height Gage

to be read by means of a Vernier to  $1/1000$  in. from 0 to 18 in. The hardened base is recessed in the bottom and ground and lapped square with the bar, allowing the gage to stand upright. The bar is approximately  $1\frac{1}{4}$  in. wide,  $\frac{1}{4}$  in. thick, and the grooves have a japanned finish. The base is  $5\frac{1}{4}$  in. long,  $2\frac{1}{2}$  in. wide, and  $13/16$  in. high.

### WALES ADJUSTABLE HOLE PUNCHING DIES



ALSO STRIPPITS—THE MOST DEPENDABLE  
STRIPPING DEVICE MADE

Why spend money for perforating dies when you can shift these "INDIVIDUAL HOLE" dies around to punch almost any arrangement of holes in flat parts?

You can be in production the same day you first see the print of a part. Punches up to  $\frac{3}{8}$  in. dia. in 14 ga. steel.

Write for detailed booklet.

**The Strippit Corporation**  
1559 Niagara St. Buffalo, N. Y.

of 18  
be fur-  
le only,

2201 SOUTH BAY ST.

2,113

DIFFERENT SIZES OF WASHERS  
CAN BE IN YOUR PLANT  
TO-MORROW MORNING!

Save Delays and Expense by  
Selecting Your Washer  
Requirements from this

### WASHER STOCK LIST

This list of washers on hand for immediate shipment includes a complete range of all standard sizes as well as hundreds of other washers in a great variety of special sizes, materials and finishes.

Sent free to  
responsible firms.

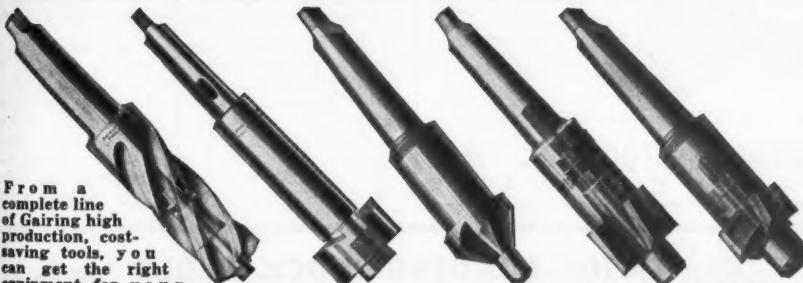


"The World's  
Largest Producer  
of Washers"

### Wrought Washer Mfg. Co.

MILWAUKEE, WIS., U. S. A.

## GAIRING COST-SAVING TOOLS



From a complete line of Gairing high production, cost-saving tools, you can get the right equipment for your tooling needs. And Gairing tools will provide real savings for you—they are **CORRECT IN DESIGN, ACCURATELY MADE, UNIFORM AS TO HARDNESS, AND LONGER IN LIFE.** Our engineers are always ready to make authoritative recommendations on your tooling problems . . . no obligation.

REPRESENTATIVES IN PRINCIPAL CITIES

WRITE FOR CATALOG

# THE GAIRING TOOL CO.

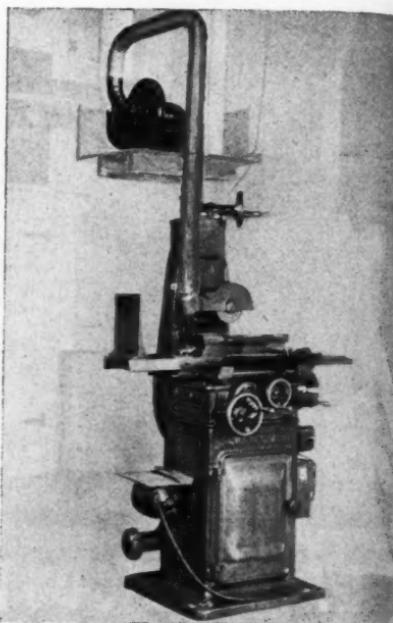
1629-35 WEST LAFAYETTE • DETROIT, MICHIGAN

**Leiman Bros. Surface Grinder  
Dust Collector**

A dust collector of simple design which can easily be attached to any individual grinder or other machine has been placed on the market by Leiman Bros., Inc., 150 Christie St., Newark, N. J. Although amply powerful, the machine is small, occupying a space of but 11x13 in. and weighing but 55 lbs. It consists of a sturdy, powerful suction blower, electrically driven, with piping connections to the machine and to the high grade dust disposal bag.

The machine can easily be located on

the floor, on an auxiliary shelf, or on a nearby post or the wall, or it can be suspended from the ceiling where necessary. Power is obtained by plugging



**SAMPSON**



**10" Stroke  
Precision  
Shaper**

**AMONG  
THE  
FEATURES:**

Variable self-acting longitudinal and self-acting vertical table feeds in either direction.  
Swivelling table.  
Extended Gear-Box and Clutch operating levers.  
Two ram speeds.  
Adjustable stroke from 0 to 10 inches.

*Write for complete details.*

**SAMPSON TOOL CO., INC.**  
101 WALKER ST. NEW YORK CITY

Leiman Bros. Surface Grinder Dust Collector into any lamp socket on a 60 cycle single phase current line. A section of sheet iron pipe which is supplied with the machine can easily be connected from the hood on the machine to the suction fan. The strong suction of air set up by the blower draws away all the light metallic and abrasive dust, and the dust is caught in a bag made

**QUICK-LOADING STOCK REELS**

**SINGLE AND DOUBLE**

For use with automatic machines and punch presses with feeds. Also reels for wire.



**S & S**

**S & S MACHINE WORKS**

**S & S**

4541 W. LAKE STREET . . . CHICAGO, ILLINOIS

or on  
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neces-  
tugging

## NEAT STAMPING IN NAME PLATES



This machine quickly stamps details and serial numbers into name plates.

*Write For Particulars*

**GEO. T. SCHMIDT, Inc.**  
1806 Belle Plaine Ave., Chicago, Ill.

## HOLES at ONCE

**4 to 50**

U. S. Drill Heads are made in standard and special sizes. Illustration shows unit for drilling 4 holes at once. Other units for as high as fifty can be obtained.

Let us show you how to save money on special jobs. Send blue prints.



**The United States Drill Head Co.**

1954 Riverside Drive  
Cincinnati, Ohio



## “MODERN” COLLETS

for

**ECONOMY  
ACCURACY  
LONG LIFE**

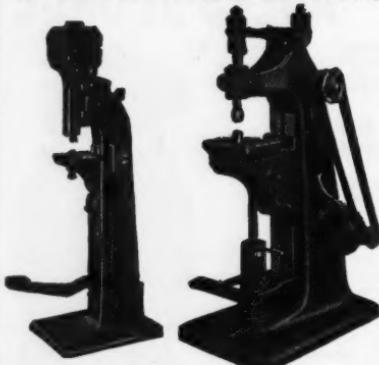
MODERN COLLETS are made of a special steel and have a hard, long-wearing surface with a tough, springy core. They are guaranteed accurate in design and taper is ground true with the hole. The deeper, better formed corrugations insure positive gripping. Lock-

ing fingers and shoes will last longer, and MODERN COLLETS exert far less strain on chucking cam and chucking cam roller pin.

*Write for our catalog on feed-fingers, cams, shaving tools and other screw machine parts.*

**MODERN COLLET & MACHINE COMPANY**  
401 SALLIOTTE ST. ECORSE, MICH.

## GRANT RIVETERS

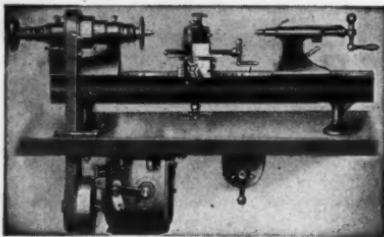


Pioneers in the riveting field. Head rivets from smallest to  $\frac{1}{8}$ " diameter, either by noiseless spinning or vibrating hammer method. Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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We restore them in most cases almost to the accuracy of new ones. Write us about repairs. Stark Precision Bench Lathes (6 sizes) Spring Bind Heads, for fast chucking. Auto Turret Heads. Motor Drive Unit, fits any bench lathe. Milling Attachment. Diamond Drills. Diamond Die Polishers. Collets. Chucks. Special Precision Tools. "Electroblast" Torch and Muffle Furnaces.

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Est. 1862 Waltham, Mass.

of specially treated filter cloth. The bag may quickly be emptied when necessary, which is usually about once a month.

### Procunier No. 2 Style E. Tapping Head

The Style E line of high speed tappers made by the Procunier Safety Chuck Company, 12 S. Clinton St., Chicago, Ill., has been augmented by the addition



Procunier No. 2 Style E Tapping Head

of a new high speed precision tapping attachment which will be known as the No. 2 Style E model. The new "Tru-Grip" tap holder, previously announced, has been developed for a larger capacity and is furnished on the new tapper. Spring collets are ground on the outside diameter and the tap holder body is ground internally to obtain maximum accuracy. Collets and tap holder are heat treated for durability.

The new "Tru-Grip" tap holder is said to be the smallest and lightest of its kind. The largest diameter is only 1 in. round and its weight, including the tap collet and chuck spindle, is only  $6\frac{1}{2}$  ounces. The chuck and chuck spindle are made in one piece to assure accuracy, rigidity and long life. The small size provides for clear vision while tapping close to a shoulder and the light weight of the "Tru-Grip" tap holder reduces flywheel effect to the minimum and reduces strain on the working mech-

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anism of the attachment. Tap collets are furnished for handling taps from No. 7 to  $\frac{1}{2}$ -in. standard.

### Vickers Series C2-1237 Feed Control Panel

A feed control panel applicable to drilling, reaming, boring, and other machine operations and adaptable to a wide variety of cycle requirements has been placed on the market by Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich. The panel will provide any cycle sequence, such as the combination of rapid

advance, adjustable coarse feed, adjustable fine feed and rapid return motions on all kinds of machine tools which are hydraulically operated. The design is such that there are but two moving parts—the main control valve and the feed compensator—which are completely and positively pressure-lubricated by the oil in the system.

The main internal control valve is actuated by one of three interconnected means; manually by the lever shown, mechanically by trip cams on moving platen or head contracting the plunger roller shown, or electrically by energizing solenoids separately mounted behind the unit. The starting of the cycle into rapid advance can be accomplished by manual movement of the control lever if the panel is convenient to the operator's station, or remotely by push button or other electrical contact means.

Change from rapid advance to feed is normally accomplished by a cam or cams contacting the plunger roller at desired points. If two feed rates during the cycle are required, the first cam usually depresses the plunger to correspond with "coarse feed" valve position and another depresses to "fine feed" position at the proper time, although other combinations can be worked out as required. When only one feed rate is required, others may be completely disregarded.

Should a rapid traverse be required between feeds, as in a jump-feed cycle, a hinged hook cam can be provided for pulling the valve plunger back up to "rapid advance" position and another conventional type cam employed to return it again. When the end of the feed stroke is reached, a limit switch or pressure switch must be actuated which energizes a solenoid and causes the main valve in the panel to be shifted to "rapid return" position. If a dwell at the end of the feed stroke is desired for machining to accurate limits against a solid stop, the reversing limit switch

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WIDTH OF JAWS 6"  
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JAW OPENS 4"

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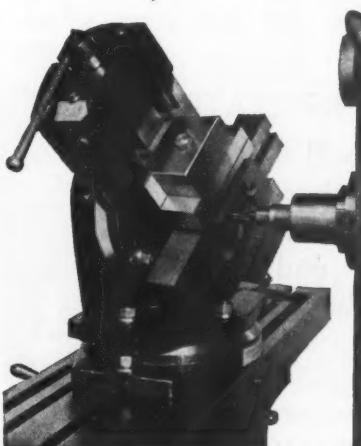
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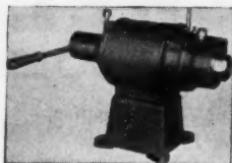
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or pressure switch starts an electric timer in the circuit which, in turn energizes the reversing solenoid at the end of a pre-determined dwell. An automatic strip action after the return stroke is obtained by a hook cam pulling the plunger back to the "stop" position. The pump is then unloaded by allowing the oil to circulate at no pressure, continuing to operate at no load until the succeeding cycle is started.

Adjustment of the two feed rates pro-

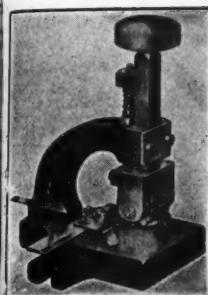


**Vickers Series C2-1237 Feed Control Panel**

vided is accomplished by means of two chromium locking type dials with graduations. Adjustments of each are instantly variable within the specified range, and adjustments can be made during the actual feeding operation. The hydraulic circuit in the panel employs the well-known Vickers Feed Control Valve and "locked circuit" combination insuring a smooth and constantly maintained feed rate for any given adjustment regardless of fluctuations in cutting tool resistance or changes in hydraulic operating pressure. This type of control eliminates changes in feed rate due to changes in pump slippage and also prevents tools from jumping ahead when breaking through the work.

The panel is small in overall dimensions for its capacity, and is carefull

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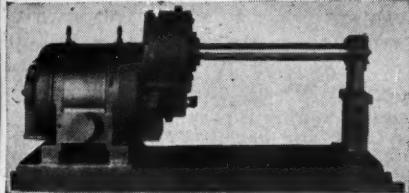
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1 to 10 wheels  
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machines built on  
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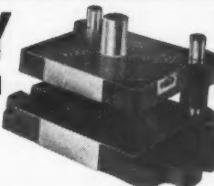
• These drives make your machines independent of line shaft location or operation. They often increase production as much as 50%. The 3 bearing drive shown above is the basis of all of our designs. It can be furnished for floor mounting, or, with our supports, for mounting directly on lathes, screw machines, shapers, millers, and other tools. Furnished with heavy duty anti-friction bearings thruout, it maintains accurate alignment and delivers a smooth flow of power under all operating conditions.

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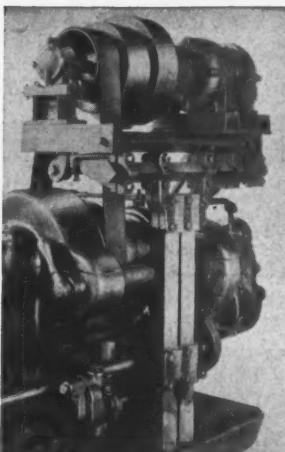
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styled to enhance the appearance of the machine upon which it is installed. All hydraulic operating equipment for a normal application is included in the one unit with the exception of the pump and pressure regulation control. The panel may be installed upon the machine or removed by inserting or loosening only six readily accessible flat head screws. There are no pipe fittings to remove at the rear of the panel, as the design is such that these connections are effected through a gasketed surface. Modifications of the design described are available.

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For Planer, Boring Mill, etc., 2 H.P. to 10 H.P. sizes.

Tool Post and Angle Plate Grinders for Lathes, etc. Write for complete catalog showing Electric Drills, Heavy Duty Grinders, Disc Grinders, Buffing and Polishing Lathes.

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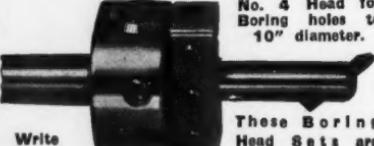
**CRALEY OFF-SET BORING HEAD**

No. 4 Head for Boring holes to 10" diameter.

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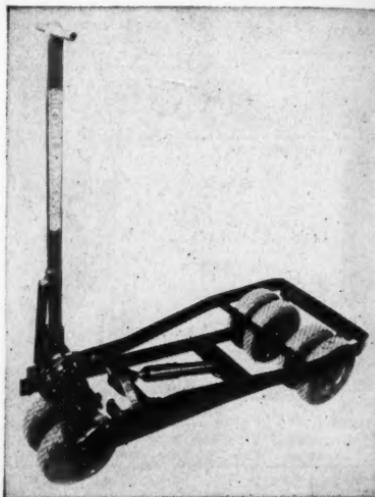
These Boring Head Sets are made in six sizes.

**C. C. Craley Mfg. Co., Shillington, Pa.**



### Yale & Towne Lift Truck with Pneumatic Tires

For handling goods that are easily damaged by vibration, the Yale & Towne Mfg. Co., Philadelphia, Pa., has brought out a lift truck equipped with pneumatic tires, illustrated herewith.



**Yale & Towne Lift Truck with Pneumatic Tires**

The tires, six in number, provide a smooth velvety ride for fragile goods up to 1500 lbs. weight. To complete the transportation job, it is necessary to drop the load to the floor without a jar and that job is well taken care of by a large hydraulic release check that is mounted in the center of the frame. It is specially adjusted to ease the loaded skid platform to the floor.



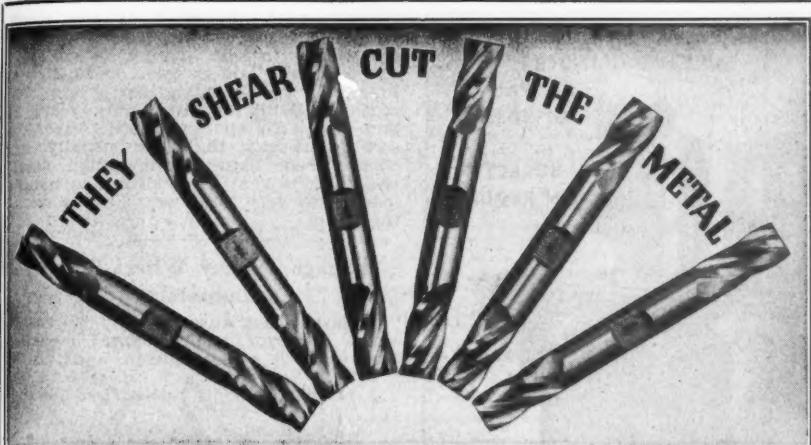
7 1/2 in. Rotary Table for Small Milling Tables.  
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Table graduated for single degree reading and worm shaft collar for readings in single minutes. Worm can be disengaged for turning table by hand.

Vertical lock pin provided for direct indexing of 2, 3, 4, 6, 8, 12 and 24 divisions. Other sizes 12" and 18" diameters.

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New Catalog just off the press, showing single and double end mills, die sinking cutters, center drills, jig boring end mills, and holders. Send for your catalog.

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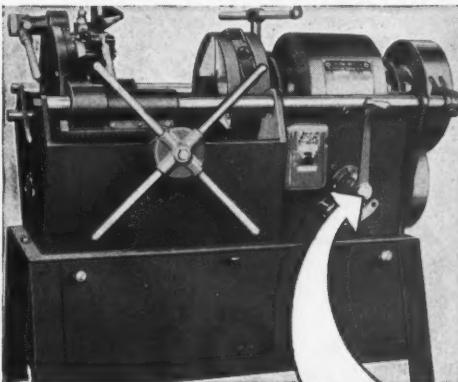
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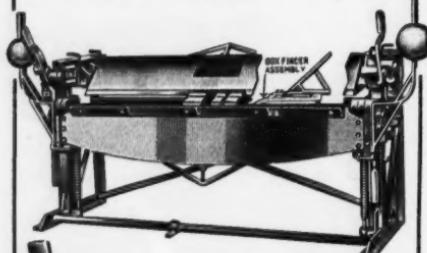
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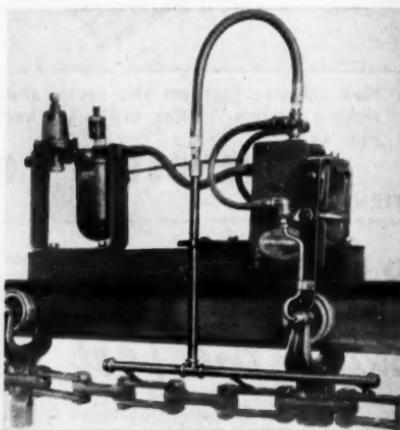
**No. 8 Imperial  
Punch**

**Whitney Metal Tool Co.  
91 FORBES ST. ROCKFORD, ILL.**

The model illustrated is the single stroke Yale Blue Streak truck which is equipped with side lift, roller lock, balanced handle and positive lifting latch. Practically of all steel construction, this model is built to give many years of service. With the pneumatic tires absorbing shocks that are usually experienced in hauling over rough floors, the truck is kept in condition to handle loads with very little wear on the working parts.

**Fauver Trolley Wheel Bearing  
Lubricator**

A device that automatically applies to every conveyor trolley wheel bearing, every time it passes a given point, lubri-



**Fauver Trolley Wheel Bearing Lubricator**

cation in the form of an oil fog, and in the same manner lubricates every pin in the chain links, is announced by J. N. Fauver Co., 91 Selden Ave., Detroit, Mich.

The self-contained assembly is mounted on the conveyor rail at any convenient point. Air pressure from the plant air line is regulated by a Norgren regulating valve and then passes through a Norgren air line lubricator where oil is fed drop by drop to the air stream to form a fine mist.

The trolley wheel, passing under the lubricator, trips a trigger which automatically releases a jet of oil fog which is applied directly to the bearing. At the same time chain link pins are simultaneously subjected to individual jets. Direction and volume of jet are easily adjustable. Lubricator has sight feed

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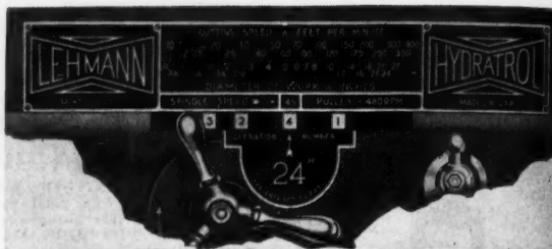
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and regulation of volume of oil fed to the air line is subject to accurate control.

Advantages claimed for this system of lubricating trolley units include unfailing lubrication of each bearing and each chain link every time they pass the lubricator, a saving in lubricant, the practical elimination of labor for applying lubricant, elimination of work spoilage due to dripping of excess lubricant, saving in power through effective lubrication of the whole conveyor system.

### Improvement on the Hydratrol Lathe

As previously announced in these columns, the Hydratrol lathe, built by the Lehmann Machine Company, St. Louis, has sixteen spindle speed changes automatically effected through hydraulic medium by the operation of a three-lever handle on the headstock. These speed changes are made at the will of



Slide Rule and Index Number Panel for Hydratrol Lathe

the operator whilst the lathe is running or stopped, with the same assurance in each case that no clash of engaging parts is possible. Coordinating with the operation of the speed changing valve, the slide rule functions, legibly presenting the cutting speeds in feet per minute for any diameter of work within the capacity of the lathe and also the spindle speed at which the machine is operating.

The latest improvement is the addition of sixteen panels for the reception of numbered tags or inscription of numbers or symbols for work operation.

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DROP FORGED STEEL

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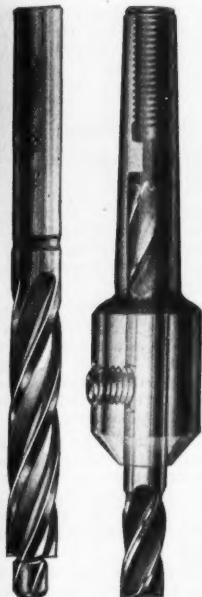
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You simply PUSH the knife through the belt. Makes a clean, square cut of any belt (except metal stitched) up to 8 in. wide. Combined guard and hold-down clamp holds belt immovable. Knife will make several thousand cuts and is readily replaceable. Used as illustrated or horizontally. Weight 4 lbs. and 3 ozs. net. Order through your distributor.

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In England at 135 Finsbury  
Pavement, London, E. C. 2

\$10.00

in the U. S. A.



It is the matter of a few minutes for a time-study man, foreman, or operator to set the valve for the desired speed for each operation and attach the number tag or mark the panel with the number or symbol for as many operations as are required on the job. The operator then can set the numbers or symbols to the central indicator, and automatically the machine changes to the spindle speeds which have been predeterminedly selected.

The illustrations show the 18 in. Hydratrol lathe equipped with this new operation number index and also an en-

larged illustration of the slide rule and index number panels. This arrangement is announced as standard equipment on all Hydratrol lathes.

### "Grip-Flex" Roller Bearing Couplings Save Expense On V Belts

A new type of coupling for V belts is announced by the Shippert Manufacturing Co., 410 S. Galena Ave., Dixon, Ill., after extensive research and tests in the Shippert Laboratories.

The new coupling, now ready for the market under the name of "Grip-Flex," is made in all standard sizes from A to E, in a variety of types to suit the size and strength of the belts. Other size couplers are made to order to fit special size belts for special application.

Features of its construction include anchor plates which completely surround the ends of the belt so that no strength is lost in attaching the coupling; trailer pins to ease the strain of heavy loads and shocks; side plates and replaceable roller bearings.

Size "A" is attached to the belt by means of a firm metal band that completely surrounds the ends of the belt. Linkage is of the hook type, and the friction pin is of the self-lubricating rawhide type of construction.

Size "B" is attached to the belt in the same way as size "A" and if fitted with case hardened bearings for the link pins, housed in a belt and bale of tough steel. The bearing is made larger than the pin, so that the pin may have a rocking action in the bearing. Sizes "C," "D" and "E" are likewise anchored to the belt with steel plates and in addition, have trailers and main coupler parts keyed to the belt ends. Heavy duty roller bearings are employed in these sizes and operate without oil.



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of men and equipment—

Eliminate costly overruns and underruns—

Speed up time study work—

Curb rising production costs—  
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### Productimeters

THE SPEEDOMETERS OF INDUSTRY

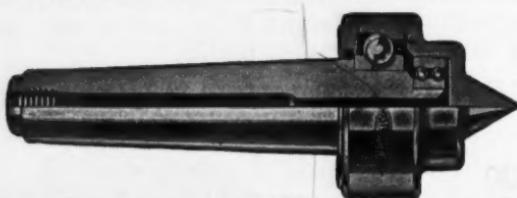
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### DURANT MFG. CO.

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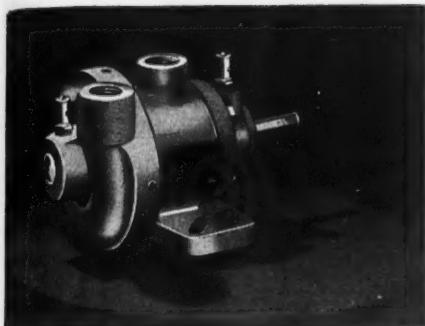
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Top is sloping with convenient pigeon holes at the back. Drawer with lock. Two sliding shelves at bottom. Height is adjustable.

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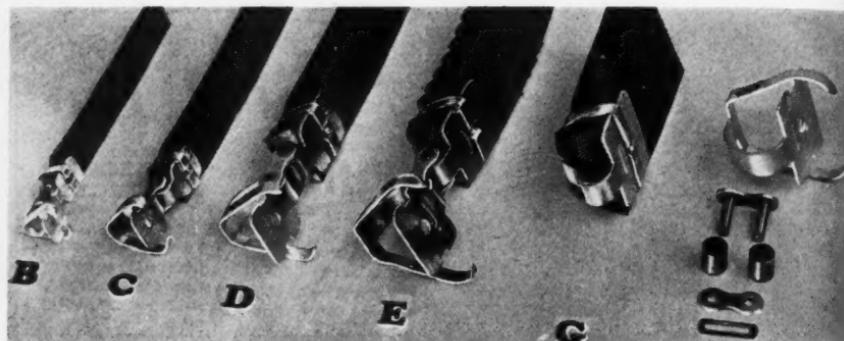


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No. 3040—One of our many patterns of All Steel Mailing Tables designed to do an efficient job for you. We also build to your specifications.



Grip-Flex Roller Bearing Couplings for V-Belts

an essential feature for coupling used on rubber-impregnated belts in heavy service.

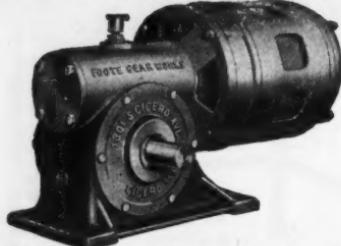
Unusual strength is claimed for the "Grip-Flex" method of coupling, in addition to dependable service in situations that put a heavy strain on belts through twisting and jerking, as in axle-lighting service on railway car equipment. Ease of attachment in

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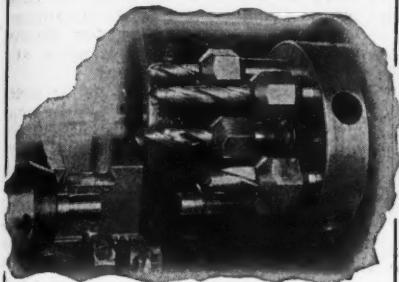
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### Ahlberg CJB Simplex Machine Units

To obviate complicated and costly machining operations and simplify the preparation required for the installation of ball bearings in machine units, the



CJB Simplex Machine Units for Machine Applications. (Left) Open cap. (Center) Closed end cap. (Right) Open cap with flinger.

Ahlberg Bearing Company, 321 E. 29th St., Chicago, Ill., has brought out the series of CJB Simplex Machine Units for machine applications illustrated here-with.

CJB Simplex Machine Units are intended to provide the machine designer with a simple, satisfactory, and economical means of applying ball bearings to equipment where the bearing housing is

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**FLEXIBLE SHAFTS***and***MACHINES****QUALITY  
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Sixty types and sizes.  
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 Attachments for hun-  
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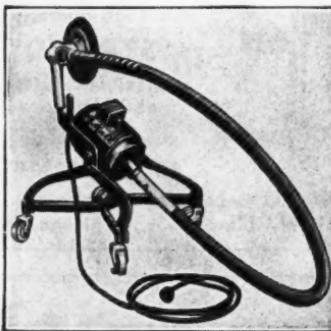
MAIN OFFICE AND WORKS  
600 E. 34TH STREET CHICAGO HEIGHTS, ILLINOIS

shaft sizes from 9/16 in. to 2 3/16 in.; the 23000 series units are available for shaft sizes from 3/4 in. to 3 in., and the 25000 series are available for shaft sizes from 1 3/16 in. to 3 1/2 in.

**Mall Power-Flex Utility Grinder  
and Polisher**

The Mall Power-Flex Utility Grinder and Polisher, a product of the Mall Tool Company, 7739 S. Chicago Ave., Chicago, Ill., is now being furnished with an improved mounting. The all-steel mounting is lower and wider than that formerly used on this tool, and is equipped with large, easy-rolling casters.

The Power-Flex is equipped with a



**Mall Power-Flex Utility Grinder  
and Polisher**

1/2 h.p., 3450 r.p.m., repulsion induction, ball bearing motor, which is said to be capable of delivering 100 per cent additional horsepower on momentary overloads. The flexible shaft is 7/16 in. in diameter and is 6 ft. long. All angle and straight spindles are full ball bearing mounted. This multiple purpose machine is said by the manufacturer to be ideal for removing excess metal after welding, polishing, buffing, sanding, drilling, and for general maintenance work.

**G-E Combination Lighting Unit**

The General Electric Vapor Lamp Company, 897 Adams St., Hoboken, N.J., has developed a combination mercury vapor lamp and incandescent light which in a single unit, produces a cool, color-corrected light that is said to be unusually well adapted for use where seeing is difficult. In this combination the blue-green effect characteristic of mercury vapor lamps alone is balanced by the reds and yellows in which the in-

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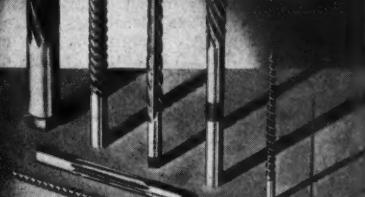
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Special Reaming Problems Invited  
Immediate Shipment on Stock  
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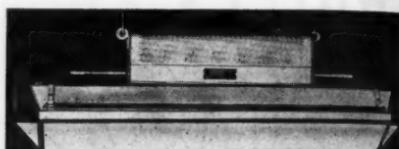
THE GAMMONS-HOLMAN CO. MANCHESTER, CONN.

candescent light is rich, producing a pleasing and sight-saving "daylight" effect. Inasmuch as this balance is obtained by adding light, the daylight effect is obtained without loss of efficiency which takes place when blue-glass bulbs or filters are used.

In the combination lighting unit a number of improvements have been made to utilize this principle more effectively. The mercury vapor light source is a straight 33-in. Cooper-Hewitt tube, 1 in. in diameter, mounted horizontally beneath an Alzac aluminum reflector of new design. The incandescent

light sources are four 150-watt Mazda lamps, located diagonally in a horizontal plane above the mercury tube.

An outstanding feature of the lamp from the sight-saving standpoint is its large light-source area and low intrinsic brightness. Due to the use of the long Cooper-Hewitt tube and well-spaced incandescent lamps, a total output of



G-E Combination Lighting Unit

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A stronger lacing (treated steel) for all transmission and conveyor belts. Goes on with hammer in few minutes. Compresses belt ends, prevents tearing or fraying. 2-piece hinged rocker pin takes up wear. 8 sizes, in boxes or long lengths, also of Monel Metal for corrosive conditions.



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**Hold-Heat Pyrometers**

11,200 lumens is evenly distributed through the 650 square in. of diffusing glass which forms an angular channel beneath the lamps. Even when the light source is directly within the line of vision, it is said that there is no glaring or blinding effect. Moreover, when the light is used where work is being done on bright metal objects or shiny surfaces, there are no annoyingly bright points of reflected glare.

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The lamp has been designed to present an efficient appearance for both the drafting room and office as well as the plant, having a smooth aluminum finish which simplifies cleaning and maintenance. The unit weighs 67 lbs. complete with tube and lamps and is completely self-contained.

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it is its  
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The Durant Manufacturing Co., 1932 N. Buffum St., Milwaukee, Wis., has brought out a meter which will prove of great interest to wire and rope manufacturers. This meter, known as the Model L-20, was designed to meet the need for a meter capable of measuring wire and rope up to 1½-in. diameter. The new unit combines speed, ruggedness, and accuracy, and is actually capable of measuring wire and rope at a rate of 5280 ft. per minute.

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The "Alnor"  
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Ideal for rolls,  
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Among the outstanding features of the Model L-20 are double worm drive to the ball bearing counting unit, in-



Mile-A-Minute Measuring Meter for Wire and Rope

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A complete new line of pocket-size voltmeters, ammeters, and milliammeters, which is designated Type AS-5 and supersedes the Type AS-3, has been announced by the General Electric Company. The new instruments incorporate



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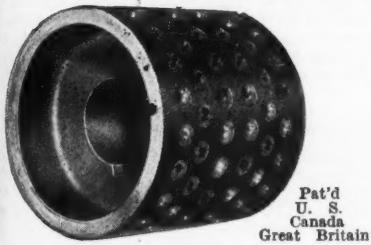


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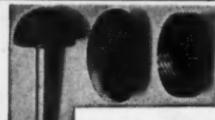


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Welded steel Stackracks allow you to pile tote pans or shop boxes ceiling high, and still keep each one accessible without disturbing the others.

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placed on the market by The Fostoria Pressed Steel Corporation, Fostoria, Ohio.

A scientifically designed reflector of spun Alzak aluminum reflects the light rays into a converging beam which brings the light to a focus about 15 inches ahead of the reflector. Uniform and intensified illumination over a restricted area results, but glare is said to be eliminated by the effective shielding of the bright light source.

The light is directed by the Fostoria Supporting Arm which is equipped with wearproof ball and socket joints, permitting easy focusing of light on work-

ing surfaces from any angle or direction without tightening or loosening the joints. An oil-resisting light cord is carried inside the supporting arm with



Fostoria Uni-focal Lamp

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Hundreds of enthusiastic users report production increases from protected workers.

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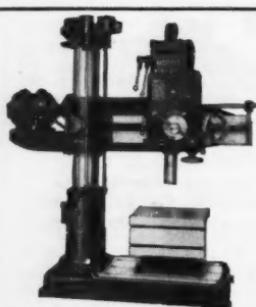
930-936 W. HILL ST., LOUISVILLE, KY.

a positive lever which is conveniently located in the handle grip on the reflector.

### Ward Leonard Industrial Controls

The line of industrial controls made by Ward Leonard Electric Company, South St., Mt. Vernon, N. Y., has been augmented by the addition of several motor starters and controllers as follows: D.C. manuals; across-the-line starters, one with thermal overload protection; D.C. automatics, across-the-line, CEMF, time limit acceleration, and current limit acceleration.

Included also are four types of motor disconnect switches; Type A fusible and



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A sturdy, dependable chuck, 3 9/16" high to meet demand for lower chuck than our standard F-7 x 16.

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Motor Bearings—"Oilite" self-lubricating

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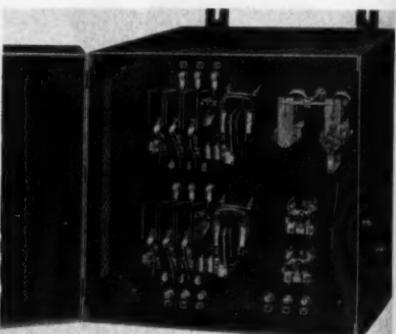
96 WARREN ST. NEW YORK, N. Y.

non-fusible, and Type C fusible and non-fusible, A. C. automatics for non-reversing service, across-the-line, primary



Ward Leonard Motor Disconnect Switch

resistor (time limit and current limit), secondary resistor for wound rotor motors, auto-transformer, and across-the-

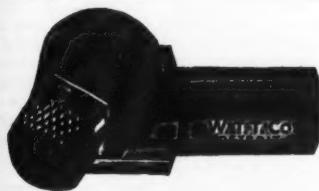


Ward Leonard Across-the-Line Switch

line type for multi-speed squirrel cage motors, A.C. automatics, for reversing service; across-the-line primary resistor and secondary resistor types.

**24x36-In. Model Blueprinter**

The 24x36-In. Model Incandescent Lamp Blueprinter shown in the illustra-



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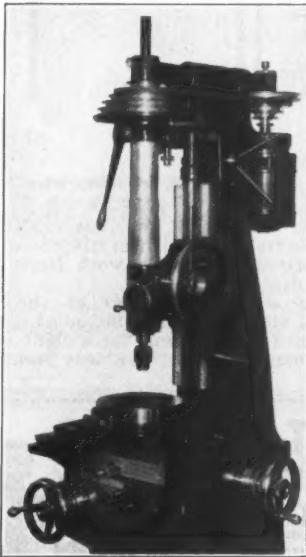
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tion has been added to the line of Angstrom lamp blueprinters made by Milligan & Wright Co., 1225 W. Third St., Cleveland, Ohio. This model, which is



24 x 36-In. Model Blueprinter

double the size of previous models has been developed to meet the need of a blueprinter to handle work larger than the 18x24-in. size.

The essential features of the older model are all retained, including the use of incandescent lamps as a light source and elimination of the belt feed by a

flat bed printing surface. A timing switch of the heavy duty type has been developed for automatically breaking the heavier current, and forced ventilation is supplied to prevent any tendency to overheat. Economy of operation is also claimed as a feature of this machine.

### Hackett K-Copper

A copper alloy, to be known as "Hackett K-Copper", which will be especially interesting to manufacturers and users of welding equipment has been brought out by the Hackett Brass Foundry, 1202 Lillibridge St., Detroit, Mich.

Hackett K-Copper is said to combine the physical properties of steel and bronze with the high electrical and heat conductivity of copper. Compared with pure copper, it has equal corrosion resistance, the same coefficient of expansion, and the same coefficient of resistivity and modulus of elasticity. It has a hardness of 70 to 80 Rockwell B (125 to 150 Brinell), ultimate strength of 70,000 lbs. per square inch, elongation approximately 20 per cent, reduction in area 50 per cent, in drawn rod 83 per cent the electrical conductivity of pure drawn copper, in forged form 75 to 85 per cent that of forged copper.

The alloy is available in bars, forgings

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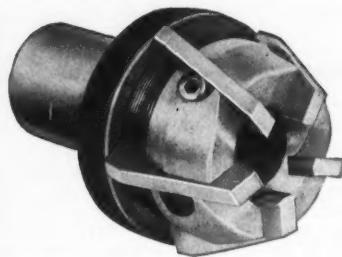
2100 Home Avenue

Dayton, Ohio



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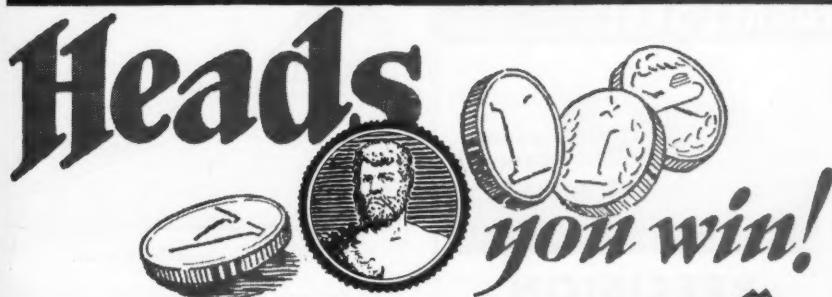
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and castings and can be used for welding tips and holders. The manufacturer states that it can be used in the manufacture of a wide range of standard and special designs of spot welding tips which have demonstrated important savings for operators of welding machines. The Hacket K-Copper tips are said to mushroom less easily than pure copper, require dressing less frequently and deliver a greater number of welds per tip.



B &amp; S Rule Slide No. 381

### B & S Rule Slide No. 381

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced a rule slide to be known as the No. 381. This rule slide is said to give a rule added value, and facilitates many measurements—especially those from shoulder to flange. It is said to convert 6-in. Nos. 300, 301, 302, 315 and 150 Rules into slide rules. It is also said to convert 6-in. No. 320 Hook Rule into a caliper rule. A spring which keeps the slide in place is easily put on the rule or removed for using the rule on either side.

### STEEL BENCH LEGS



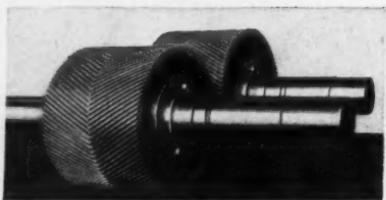
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### PRECISION

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Farrel-Sykes precision generated gears insure smooth, quiet operation and dependable, economical performance under every condition of service. Our engineers are at your service in connection with your gear problems.

### FARREL-BIRMINGHAM

COMPANY, INC.

381 Vulcan Street, Buffalo, N. Y.

### Williams Adjustable Wrenches

J. H. Williams & Co., 75 Spring St., New York City announce two new lines of Adjustable Wrenches, both embodying new design features. Square shoulders on the movable jaw shank are said to overcome the wedging and spreading ac-



Williams Adjustable Wrench

tion common to the conventional cylindrical bearing and to provide a positive bearing against working stress. This design permits a thicker and stronger "web" without increasing a total head thickness of the wrench.

Williams' "Adjustable" Wrenches are drop-forged from a special Carbon Steel which gives them unusual strength. This line is supplied in a natural polished steel finish.

Williams' "Superadjustable" Wrenches are forged from Chrome-Alloy Steel providing a well-balanced tool of trim design...thin, light and strong. This line is finished in chrome-plate with

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Semi Steel Body — Four Jaw Independent

1 1/4" nickel steel screws

1 1/4" width of jaws

3 1/2" width of body

### 3 SIZES

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To save time and space in stock-rooms and maintenance departments, the Laminated Shim Company, Inc., 23 44th Ave., Long Island City, N. Y., has brought out a dispensing unit designed to keep all sizes of shim stock together in one place and in order so that the size desired is instantly available.

The dispenser is, in effect, a metal rack in which the cylindrical containers carrying the shim stock are placed, the edges of the stock projecting as shown in the illustration. In addition to the thin stock, 2x9 in. aluminum strips are also held in a special container at the bottom.

The dispenser not only saves time and keeps the stock in order; it prevents damage to the paper-thin stock-sheets and also prevents cuts and scratches on the user's hands. The dispenser is available without charge to purchasers of the special assortment of shimstock for which it is built.



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"GLEDHILL" COMBINED DRILLS AND COUNTERSINKS are designed and tempered correctly to give long and uninterrupted service. Thin web at point, thickening at countersink with flutes milled to allow free elimination of chips. SPECIFY "GLEDHILL" when ordering.

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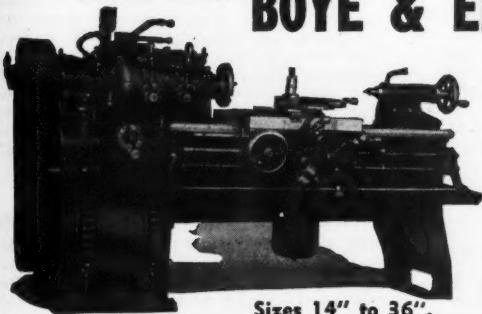
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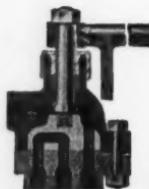


### Kwik-Cote Copper Plate Solution

To lower the cost of plating where selective hardening is necessary, Grapho Products, Inc., 2234 Alvord St., Indianapolis, Ind., has developed a chemical compound with which a copper plating can be deposited on that part of the work which is to remain unhardened. The compound being in the form of a solution which can be applied by dipping or painting with a small brush. It is said that hair-line separation of hardness can be secured with positive results.

The solution dries almost immediately

and work so treated can be placed in the carburizing pots at once. Only the parts to be kept soft are treated. Threads treated with Kwik-Cote may be kept dead soft and in perfect condition while the remainder of the piece is hardened, and it can be used between cams, back of gears, in bores where stock is to be left for reaming after heat treating, on springs, and so on. It is said that the solution may be used also as a base for nickel or chrome plating. The work is thoroughly cleaned, dipped in the solution, the surplus liquid washed off and the work is then ready for plating.



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For use on air, water, steam or oil for operating single and double acting cylinders, on pressures up to 5000 lbs. Made in Lever, Foot and Solenoid and Motor Operated types.

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Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

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### "Grainlock" Water Soluble Cement

A cement for use in setting up polishing wheels which, according to the manufacturer, hardens rather than softens under heat and which requires no cooking, has been placed on the market by Industrial Lubricants Co., 5734 12th St., Detroit, Mich. This cement, which is known as "Grainlock", is a water soluble cement which has been chemically treated to lessen the surface tension and make it more penetrating in solution than ordinary water. It does not have to be heated to make it penetrate into the pores of abrasive grains, even though the grains may have been exposed to normal shop dust. It is intended to be used just as it comes—without thinner and without heating.

The manufacturer states that "Grainlock" cement holds the grain with maximum tenacity and the grain is said to shell off very slowly. The large number of pieces that can be polished with one wheel "set-up" mean less frequent wheel changes and more steady production by the use of comparatively few wheels.

The fact that "Grainlock" hardens rapidly under heat makes it possible to force-dry wheels and thus speed up the setting up operation. A more important feature is the fact that friction heat

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*By Using Yost Drill Press Vices*

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

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**Grinding Wheel Dressers**

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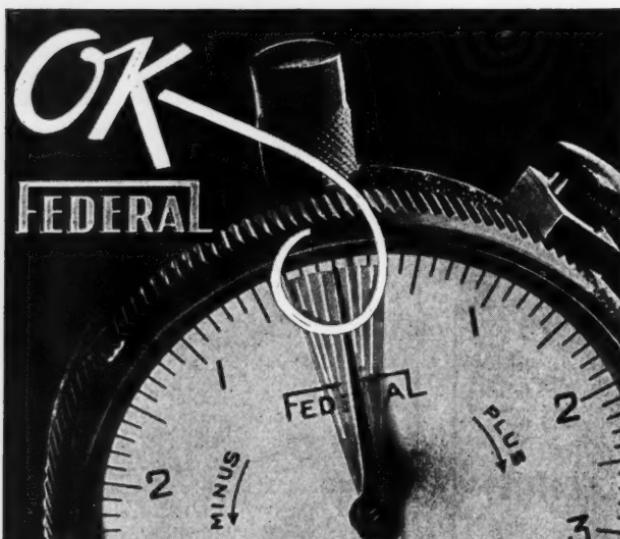
generated in operation causes "Grain-lock" to become brittle and fracture into small areas as the wheel runs and comes in contact with the work. Fresh cutting edges of the grain are thus constantly being exposed to the work with the result that the cutting is more open. This is said to mean that a "Grain-lock" set-up wheel has less tendency to clog when polishing soft metals, resulting in longer service and less opportunity for scoring the work.

Hardening under heat is also said to reduce glazing to a minimum and thus prevent "wheel burn." Inasmuch as the cement does not soften under heat, it is impossible for the grains to sink into

the glue. With the polishing grains maintained on a hard surface, the work cannot come in contact with the bonding agent and is thus prevented from discoloration. With no burning of the wheels, there are no burned wheels to repair.

Inasmuch as no cooking is necessary, the expense of cooking equipment is saved in addition to the floor space which otherwise would be necessary. The fast-drying quality of the cement reduces the number of drying racks required. The fast cutting action and high efficiency of the wheels set up with "Grainlock" reduces costs on polishing jobs.

A sample of "Grainlock" polishing wheel cement will be sent to any plant executive or polishing department foreman upon request.



*When this hand says OK  
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Federal Indicators insure precision on thousands of operations on hundreds of commercial products. You know quickly and definitely what the facts are if you use a Federal Indicator. Send for descriptive catalog.

**FEDERAL PRODUCTS CORP.**

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Detroit • Chicago • Muncie • Cleveland • New York

**ROLLING MILL BEARING BOOK.**  
The Timken Roller Bearing Company has just issued a 64-page, 8½x11-inch booklet entitled "The Answer to Rolling Mill Bearing Problems" which presents in brief the reasons why Timken Bearings have achieved their present wide use in the rolling mill industry. Well printed and liberally illustrated with both photographs and mounting diagrams showing typical applications of Timken Bearings to various types of mills, screw-downs, pinion stands, gear drives, table rolls, reels, straighteners, levelers, hot saws, cranes and cars, this new publication will appeal strongly to mill designers and operators.

In the back of the book are listed Timken equipped rolling mills, main roll drives and rolling mill pinion stands.

giving the name of the company using the equipment, the type and size of the installation, the positions in which the bearings are used and the bearing numbers, these lists being as of July 1, 1936. No attempt has been made to list the many other Timken applications in connection with rolling mills.

There have been 689 Timken equipped rolling mill stands installed in the United States and Canada, starting with 3 in 1926. Of these stands, 126 are listed in this new Timken publication as installed during 1935 and 118 as installed or on order during the first half of 1936.

Copies of this new booklet may be secured without cost on application to The Timken Roller Bearing Company, Canton, Ohio, or any Timken district office.

**WETMORE ADJUSTABLE REAMERS.** Wetmore Reamer Company, 414 North 27th St., Milwaukee, Wis., has announced publication of a new revised general catalog of their products, comprising a complete line of adjustable reamers for the metal-working trade. The book contains 24 pages of descriptions and illustrations of the tools made by this firm, including several additions to the Wetmore line which are now being offered to the trade for the first time. Included also are data on a variety of special tools, standard precision reamers and equipment to reduce reaming costs. The text includes complete specifications and prices. Copy free upon request.

**J & L AUTOMATIC THREAD GRINDING MACHINE.** This 12-page booklet contains a complete description and specifications of the automatic thread grinding machine now being made by Jones & Lamson Machine Co., Springfield, Vt. The text is separated into chapters dealing with power and drive, headstock and work spindle, tailstock, grinding wheel spindle and wheel head unit, trueing device, taper attachment, single lever work speed selector, automatic feed, relieving attachment, attachment for grinding annular grooves and threads without lead, attachment for flute jumping, thread matching device, and other features of the machine. Each individual unit is nicely illustrated and the book should be of prime value to users of thread grinding machines. Copy free upon request.

Mention MODERN MACHINE SHOP when writing to advertisers. You cooperation will be appreciated both by the advertiser and this magazine.

**Hollands Vises.** The complete line of machinists' solid and swivel jaw vises, offset jaw vises, pipe vises, clamp vises, pipe and tube cutters, stocks and dies, melting pots, pouring ladies, and other tools made by Hollands Manufacturing Co., Erie, Pa., is described and illustrated in Catalog No. 36, now being issued by this firm. Copy free upon request.

**FELLOWS COMPLETE EQUIPMENT FOR CUTTING, FINISHING, AND TESTING GEARS.** Considerable advancement has been made during the past few years in methods and equipment for cutting, finishing, and testing gears, a large part of which is represented by the products of The Fellows Gear Shaper Company, Springfield, Vt. Anticipating a great increase in the use of accurate, finely made gears, this company has put out a 64-page book in which are described and illustrated in detail the various types and kinds of gear cutting, finishing, and testing equipment which are made by this firm.

The principle upon which the Fellows Gear Shaper operates is explained in detail and the functions of the various parts of the machine are outlined for the benefit of those who may not previously have been familiar with this type of gear cutting equipment. Consecutive chapters discuss the burnishing machine, lapping machine, cutter sharpening machine, the "Red Liner", various kinds of gear measuring machines, and the Fellows Gear Shaper Cutter.

A copy of this book is available to any mechanical engineer or executive upon request.

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**7A-TYPE SPECIAL HIGH-SPEED FELLOWS GEAR SHAPER.** This 4-page folder describes the new 7A-Type Special High-Speed Gear Shaper and the gap-type roughing and finishing for which this gear shaper is especially adapted. Both the gear shaper and the gap-type cutter are products of the Fellows Gear Shaper Company, Springfield, Vt. The particular advantages of the gap-type cutter are set forth in this folder and the folder is well illustrated. Copy free upon request.

**GEOMETRIC TOOLS.** The Geometric Tool Company, New Haven, Conn., has issued the following new bulletins on Geometric Tools. Combination Die Head Booklet (Style TR and Style TH using tangent or circular chasers). EJ2 Die Head (a small solid adjustable die head intended for use where solid dies of the round, button or other types are now used). Geometric No. 12 Threading Machine Specification Sheet.

Copies of the booklets referred to above are available upon request.

**A PRESENTATION ON PRODUCTION GRINDING (HONING).** This book, issued by Carborundum Company, Hutto Machine Division, 515 Lycaste Ave., Detroit, Mich., discusses the general principles of finishing work by the honing process, contains a complete bulletin on the subject of determining the proper cylinder finish, and closes with descriptions and pictures of the various types of hones and honing machines made by this firm.

The presentation lists the various types of work which can be finished to advantage by the use of Hutto equipment, discusses the general principles of finishing work by the use of the hone, explains the grid effect, production of round straight bores, floating cone principle, the grinding of blind end cylinders, relation of finish and fit, surface calibration, selection of grit and bond of abrasive, coolants, and other factors involved in the finishing of work by the honing process. Included also is a section of "Pertinent Facts on Grinder Designs, and Instructions as to Their Adaptability and Use."

The equipment section presents the various types and designs of hones, various types and designs of honing machines in both vertical and horizontal types and with single or multiple spindles, and closes with a discussion of the "Hut-O-Lap" machine for lapping gears.

A copy of the book will be sent without charge to production engineers and mechanical executives upon request.

**CLEARING CRANKLESS STEEL POWER PRESSES.** This book, now being issued by Clearing Machine Corporation, 6499 W. 65th St., Chicago, Ill., presents a wide range of sizes and types of crankless steel presses now being built by this firm. The design of the press, the outstanding feature of which is elimination of the crankshaft, is explained in detail and the text is illustrated with drawings and photographs. The book also contains many illustrations and descriptions of jobs upon which these presses are being used. Copies free to press shop engineers and executives.

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